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Haemolytic *Escherichia coli* and "Oedema Disease" of Pigs

BY

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Introduction

IT has been known for a considerable time that coliform bacteria are associated with a variety of pathological conditions in man and domestic animals, but until recently there have been no reliable biochemical or serological methods available for the classification of the various types in order to determine which of them might reasonably be considered as pathogenic.

Classification of *Escherichia coli* into various types on the basis of their fermentative properties appears to be unreliable (Dudgeon, Wordley & Bawtree, 1921; Lovell, 1937; Vahlne, 1945; Knipschildt, 1945; and Wramby, 1948).

Early investigations into the classification of *E. coli* strains on a serological basis were not entirely successful, because many strains were inagglutinable in the living state, and not until the discovery by Kauffman (1943) of a hitherto unsuspected, heat labile, surface antigen ("L" antigen) which prevents "O" agglutination was it possible to use agglutination methods for this purpose.

Smith & Bryant (1927), investigating mucoid *E. coli* strains isolated from cases of "white scour" in calves, observed that mucoid forms which have capsules may mutate to give rise to non-mucoid, acapsular forms. Serum produced from the "daughter form" agglutinated the homologous acapsular forms to a high titre, but had no influence on mucoid forms. Serum prepared from the mucoid form agglutinated the homologous capsular strain to a very low titre (1:40) but the non-capsulated "daughter" forms to a high titre (1:40,960).

Employing a precipitation test, Lovell (1937) was able to place strains of *E. coli* from "calf scour" cases into specific groups. He also showed that there were two types of antigen, a capsular and a somatic.

Kauffmann and other Scandinavian workers (Knipschildt, Vahlne, Wramby, etc.) eventually demonstrated that the complexities of the *E. coli* antigens could be resolved in a manner similar to that applied to Salmonella typing. As mentioned above, Kauffman (1943) showed that a heat labile surface antigen was present which caused "O"-inagglutinability. By heating organisms to 100° C. he was able to destroy this "L" antigen, thus allowing the "O" antigen to react with the homologous serum and produce agglutination to a high titre. By absorbing immune "OL" serum with boiled cultures, it was possible to remove "O" antibody, leaving the "L" antibody. Using this technique, Kauffman identified several different "L" antigens, and further types were added to this list by Knipschildt (1945a) and Vahlne (1945). Later, Kauffman (1944a, b) found that certain strains were not rendered "O"-agglutinable in spite of heating at 100° for 2½ hours ("A" forms). Knipschildt (1945a, b) showed that this heat-stable antigen "A" is associated with a morphological capsule. Strains possessing "A" antigen when treated with homologous serum showed a typical capsular swelling. These antigens differ serologically from one another and 13 separate "A" antigens have been identified. Vahlne (1945) showed that "O"-inagglutinability of strains with "A" antigen can be abolished by autoclaving at 120° C. for two hours. Knipschildt (1945a) identified a third surface antigen "B" which also causes "O"-inagglutinability. Heating the organism at 100° C. will destroy the "O" inagglutinability of this antigen but not the agglutin-binding property. For these three antigens, "L," "A," and "B," Kauffman & Vahlne (1945) suggested a common term; "K" antigen. When these techniques for destroying "O"-agglutination inhibiting factors had been established it was possible to type coliforms according to their "O" antigens, which are heat resistant.

Most *E. coli* strains are motile, and Kauffman demonstrated three flagellar ("H") antigens. Vahlne (1945) added 19 more "H" antigens. All flagellar

antigens appear to be monophasic. Kauffman (1944a) established the first antigenic scheme for *E. coli* consisting of 20 selected " O " groups. Kauffman and Knipschildt demonstrated 110 " O " groups but only the 25 most common types have been incorporated into their scheme, which was further elaborated by Vahlne (1945). The present Antigenic Diagnostic Schema of *E. coli* according to Kauffman, Knipschildt and Vahlne consists of 25 " O " groups which are subdivided into several types according to their " O," " K " and " H " antigens. So far 126 " O " groups, 62 " K," and 34 " H " antigens have been identified.

Pathogenicity of *E. coli*

In a variety of conditions involving man and domestic animals a volume of evidence has accrued which suggests strongly that strains of *E. coli* which may reasonably be implicated as pathogens fall into certain serological types.

The evidence for this assertion is given in the following short review, covering both man and domestic animals.

A. Pathogenicity of *E. coli* for Man

(a) Topley & Wilson (1955) state that *E. coli* are responsible for the majority of suppurative cholecystitis cases.

(b) The same authors (1955) have pointed out that various suppurative conditions of the urinary tract are often caused by *E. coli* and that in males a haemolytic type appears to be more common than in females. Dudgeon *et al.* (1921) stated that almost all haemolytic urinary strains were agglutinated by one antiserum prepared from one strain.

(c) In acute gastro-enteritis of children, *E. coli* was found to be commonly implicated, the majority of strains falling into a relatively small number of serological types (Bray, 1945; Bray & Beavan, 1948; Giles & Sangster, 1948; Bray, 1949; Smith, 1949; Taylor, Powell & Wright, 1949; Kauffman & Dupont, 1950; Orskov, 1951; Taylor & Charter, 1952; Charter & Taylor, 1952).

The first work of importance appears to have been that of Bray (1945), who produced evidence suggesting that a single sero-type, which he called *Bact. coli neapolitanum*, was the cause of " summer diarrhoea " in infants. Subsequently, other authors (Giles & Sangster, 1948; Bray & Beavan, 1948; Taylor *et al.*, 1949) reported on the common occurrence of this serotype, under various names, in infantile gastro-enteritis. It is now known as 0111 : B4 (Kauffman, Knipschildt and Vahlne classification).

Smith (1949) described another serological type of *E. coli* associated with infantile gastro-enteritis. This type is now known as 055 : B5. The number of serotypes of *E. coli* reported from gastro-enteritis is still increasing (Orskov, 1951, 1953; Kauffman, 1954).

Kauffman (1954) summarises the results as follows: —

" The aetiological significance of certain serological types of *E. coli* for epidemic infantile enteritis cannot be doubted to-day. Until now the following types have been involved: 111 : B4, 55 : B5, 26 : B6, and 87 : B7, and further subtypes can be differentiated with the aid of " H " antigens and phages. Although it is possible that further Escherichia types are involved, we should be very cautious in the recognition of such types as the aetiological agents of infantile enteritis."

B. Pathogenicity of *E. coli* in Domestic Animals

(1) Bovine

(a) *" White scour " in calves*

A condition of young calves characterised by intense scouring and often associated with a high mortality rate, has been well recognised for many years.

Jensen (1893) was able to show that a bacteriaemia occurred in these scouring calves, the organism being *B. coli commune*. The association between *E. coli* and " white scour " has been since recorded by many authors in various countries (Nocard & Leclainche, 1903; Joest, 1903; Titze & Weichel, 1908; Smith & Little, 1922, 1927; Smith, 1927, 1928; Lovell & Hughes, 1935; Lovell, 1937).

Lovell (1937) examined *B. coli* strains from outbreaks of " white scour " and, using a precipitin test, demonstrated two antigens, capsular and somatic. He was also able to " place " these strains into specific groups (eight types) and concluded that " special races of *Bact. coli* pathogenic to young calves exist."

Wramby (1948) analysed serologically 4,262 strains of *E. coli* isolated from calves which died of coli septicaemia and 1,699 strains from healthy calves. He found that the coli flora in pathological material was more uniform than that of normal material.

Bokhari & Orskov (1952) have also reported on " O " grouping of *E. coli* in cases of " white scour."

Lovell (1955) in his review of intestinal diseases of young calves summed up the situation as follows: " In white scour, the specific organism, usually *Bact. coli*, is capable of killing calves under certain conditions. The identification of strains of *Bact. coli* by serological means is being used successfully in calf diseases . . . It appears that based upon this type of analysis, some serological types of *Bact. coli* are particularly associated with white scours in calves."

(b) *Mastitis*

H. Fey (1953) examined 136 coliform strains from bovine mastitis, 113 of which proved to be *E. coli*; on typing, 74.5 per cent. of these strains belonged serologically to seven most frequent " O " groups: 2, 6, 8, 9, 21, 81, and 86. These seven " O " groups accounted for only 5.07 per cent. of *E. coli* strains isolated from normal bovine faeces, and Fey states that this difference is statistically significant.

(2) Fowls

It is well recognised that *E. coli* may be associated with deaths in chicks in their first week of life. Hygienic conditions are usually poor in these cases and other adverse environmental conditions prevail.

Wramby (1948), in his monograph, states that in 1941 he examined fowls showing granulomata in the intestines and livers and isolated from them *E. coli* of mucoid character.

Hjärre & Wramby (1945) showed experimentally that this type of *E. coli* was the cause of a granulomatous condition.

Wramby (1948) examined 50 cases of granuloma in fowls and showed that the mucoid *E. coli* isolated from these cases fell into three types, each of which showed constant fermentative and serological characters.

Ulbrich (1951) also studied this condition in fowls and found that the majority of the 36 typical mucoid *E. coli* isolated belong to " O " group 4 and a few to " O " group 8 and 16. The " K " antigens were mainly 6, 7, 9, and 12, and some were 4 and 8.

Edwards & Ewing (1954) examined serologically 30 strains of *E. coli* isolated in pure culture from the internal organs of fowls. All belonged to a single sero-type, O2 : K1 : H5 (this type was not found among 200 cultures from the intestines of fowls and other domestic animals, or in the stools of persons handling food and others affected with diarrhoea). A characteristic of the above 30 strains was that the organism was isolated in pure culture and that they tended to be invasive and in some instances produce infection.

(3) **Pigs**

Much less information regarding the pathogenicity of *E. coli* in the pig is available. It has been incriminated as a cause of agalactia in sows and scouring in piglets (Jackson, 1952).

Some cases of verrucose endocarditis, usually attributable to *E. rhusiopathiae*, have been found to be due to *E. coli* (Gaitandjieff, 1940).

Parnas *et al.* (1950) studied 70 haemolytic strains of *E. coli*, isolated from dead piglets, and found that strains isolated from the viscera were more virulent than those isolated from faeces.

" Oedema Disease " in Pigs

Recently it has come to our notice that a haemolytic *E. coli* can be isolated from the intestines and mesenteric lymph nodes of pigs which have died of " oedema disease " (Hudson, Huck & Shand, 1951; Buntain, 1951; Gitter, 1953; Schofield & Davis, 1955).

" Oedema disease " was first described by Shanks (1938) in Northern Ireland, although it is quite likely that it occurred well before that date in the British Isles. Hudson (1938) was the first to draw attention to its occurrence in England.

The disease has been described as " a condition which attacks thriving pigs and is characterised by evidence of inco-ordination and partial or complete paralysis with oedema of various organs, principally the stomach wall and mesentery " (B.V.A., 1956). The aetiology of this condition has remained obscure and a variety of suggestions have been put forward.

The regular isolation of haemolytic *E. coli* from the intestine and mesenteric lymph nodes, but not from the parenchymatous organs, of " oedema disease " cases has led us to a further examination of this organism. As haemolytic *E. coli* are also recoverable from pigs not suffering from " oedema disease," it appeared desirable to attempt a differentiation of the various haemolytic strains isolated. Differentiation on a biochemical basis seemed to be unsatisfactory and serological classification was therefore attempted.

Material

The present investigation comprises 77 haemolytic strains of *E. coli* isolated from the intestinal contents or mesenteric lymph nodes of pigs which have died of " oedema disease." Most of these strains were isolated either at Weybridge or at various Veterinary Investigation Centres. Some were received from other sources (Northern Ireland, France, and Italy).

The cultures from intestinal contents and mesenteric lymph nodes were obtained by direct plating on sheep-blood agar. The same method was used in culturing liver, heart, spleen, and kidneys.

The cultures received from other laboratories were on various solid media or " freeze-dried " and were plated as above. A control group of 58 strains of *E. coli* (mostly haemolytic) isolated from pigs suffering from conditions other than " oedema disease " was included.

One hundred and fifty-three rectal swabs, 47 of which were obtained from pigs in " oedema disease " outbreaks and the rest from healthy pigs on " oedema-disease free " premises, were also examined.

Methods

Blood plates were incubated at 37° C. overnight. Type of colony and degree of haemolysis were noted. From each plate a number of haemolytic colonies were examined by the slide agglutination test using our " standard " sera. A selected colony from each plate was then investigated.

Biochemical Methods

All the strains were examined for their ability to ferment the following substances: lactose, maltose, dulcitol, sucrose, glucose, mannitol, xylose, salicin, and inositol; incubation being continued for 21 days at 37° C. and read every day.

The cultures were examined also for their capacity to produce indole, to utilise citrate (in Koser's citrate medium); for their ability to split urea (Christensen's urea medium); for M.R. and V.P. reactions; H_2S production and capacity to liquefy gelatine (tested in ferric chloride gelatine).

Serological Methods

The techniques employed were based mainly on those used by Charter & Taylor (1952).

Preparation of Hyperimmune Sera

(a) *" OK " Sera*

The inoculum was prepared from an overnight culture on a 0.1 per cent. glucose agar slope. The growth was suspended in a quarter-strength Ringer's solution in saline in such amount as to give an approximate opacity of 500,000,000 organisms per ml. This suspension was injected intravenously into rabbits within half an hour of its preparation, and repeated at four-day intervals using the following doses: 0.25, 0.5, 0.5, 1.0, and 1.5 ml. On the fifth day after the last injection the rabbits were test bled from an ear vein. Serum obtained was examined by the tube agglutination method for " O " and " K " titre.

If satisfactory titres were obtained the rabbits were bled again, but if titres were low a further dose of 1.5 ml. of inoculum was given and the rabbit re-tested. After two bleedings from the ear, the rabbits were bled out and the serum separated.

(b) *" O " Sera*

Overnight cultures in peptone broth were boiled at 100° C. for 2½ hours and used as the inoculum.

Injections and bleeding were carried out as described for the " OK " sera.

Slide Agglutination Test

Drops of undiluted sera were placed on a glass slide under a dissecting microscope and a portion of the selected colony was thoroughly mixed with the serum. Several isolated smooth colonies and confluent growth from each plate were tested.

Positive agglutination into coarse particles occurs very rapidly and cannot be dispersed by vigorous stirring.

The slide agglutination test is a simple method of " K " antigen determination and can also be used for the detection of " O "-inagglutinability (Vahlne, 1945; Kauffman, 1954).

Tube Agglutination Tests

(a) *Determination of " O " antigen*

(i) Preparation of " O " suspension. Overnight broth cultures were heated at 100° C. for half an hour. Strains which remained inagglutinable after this treatment were autoclaved at 120° C. for two hours.

(ii) Technique of actual test. Serial doubling dilutions of serum (from dilution 1:50 to the titre of the serum used) were dispensed in 0.4 ml. amounts in Dreyer's tubes and an equal volume of " O " suspension was added. A negative control (saline and " O " suspension) was included.

The tubes were incubated in a waterbath at 56° C. overnight and read the following morning.

Interpretation of the results was in the same manner as in the determination of Salmonella somatic antigen.

Determination of " K " Antigen

Preparation of " K " Antigen

(i) *Preparation of " K " suspension.* Overnight cultures on 0.1 per cent. glucose agar slopes were suspended in 1:1,000 mercuric iodide and diluted with normal saline to give an opacity of approximately 400,000,000 organisms per ml.

(ii) *Technique of Test.* Dilutions of " OK " sera were prepared as before and delivered in 0.5 ml. amounts into round-bottomed tubes (1 by 7.5 cm.). 0.04 ml. of " K " suspensions were added to each tube by means of a " 50 " dropper (a pipette which delivers 50 drops per ml.). The tubes were incubated at 37° C. for two hours and then left at room temperature overnight. Reading is similar to that used for the Vi-antigen determination of *Salm. typhi.*

A positive reaction is shown by a clear supernatant fluid with a granular deposit spread over the bottom of the tube which does not give uniform turbidity on shaking.

Negative reaction is characterised by the formation of a compact button at the bottom of the tube, which when shaken, re-suspends to a uniform turbidity.

Later in our investigations, unabsorbed " OK " serum was used for " K " antigen determination for all " O " inagglutinable strains.

As there was no attempt to demonstrate motility in strains investigated, " H " antigens were not determined.

Results

Primary cultures from intestinal contents of incontrovertible cases of " oedema disease " yielded pure, or almost pure, growths of haemolytic *E. coli* in all cases which were examined at Weybridge.

The colonies from all cases were rather opaque and surrounded by a wide zone of haemolysis. On repeated subcultivation none of the strains lost this marked haemolytic activity.

Three strains of haemolytic *E. coli* (E.1, 2, and 3) isolated from different outbreaks of " oedema disease " were chosen as " type " strains and " O " and " OK " sera prepared in rabbits against each of them.

Each strain agglutinated with its own serum to a relatively high titre (" O " titres averaged 1:3,200 and " K " titres 1:400) and also each of the sera agglutinated the other two strains to the same titre (see Table 1).

TABLE 1

TUBE AGGLUTINATION RESULTS OF THE " TEST " STRAINS (E.1, 2 AND 3)

Strains	SERA											
	" OK " 1		" O " 1		" OK " 2		" O " 2		" OK " 3		" O " 3	
	" O " Titre	" K " Titre	" O " Titre	" K " Titre	" O " Titre	" K " Titre	" O " Titre	" K " Titre	" O " Titre	" K " Titre	" O " Titre	" K " Titre
E. 1.	1 : 3,200	1 : 400	1 : 3,200	Nil 1 : 50	1 : 6,400	1 : 400	1 : 3,200	Nil 1 : 50	1 : 3,200	1 : 400	1 : 1,600	Nil 1 : 50
E. 2	1 : 3,200	1 : 400	1 : 3,200	Nil 1 : 50	1 : 6,400	1 : 400	1 : 3,200	Nil 1 : 50	1 : 3,200	1 : 400	1 : 1,600	Nil 1 : 50
E. 3	1 : 3,200	1 : 400	1 : 3,200	Nil 1 : 50	1 : 6,400	1 : 400	1 : 3,200	Nil 1 : 50	1 : 3,200	1 : 400	1 : 1,600	Nil 1 : 50

On the basis of these results it was considered that, if not identical, all the three strains must have a very similar " O " and " K " antigenic structure.

A new strain, referred to as E.4, isolated from a typical case of " oedema disease," was agglutinated by the sera of all three strains to their titres. The diagnosis of this case was amply confirmed, since an extract of the intestinal contents given intravenously to several experimental pigs produced on each occasion symptoms and lesions typical of " oedema disease " (after the manner of Timoney's experimental reproduction—see Timoney, 1950).

Subsequently hyperimmune " O " and " OK " sera were prepared from this strain (" O " titre was 1:3,200 and " K " titre 1,400) and was used as the " standard " typing serum.

It was considered that " O " and " K " titres were sufficiently high to show any differences between this strain and related serological types, which were to be investigated. Subsequently all haemolytic strains isolated from " oedema disease," and *E. coli* isolated from other conditions in pigs, were tested against these sera (" OK "4 and " O "4).

" K " antigen determination in the first 11 strains (E.1 to E.11 inclusive) were carried out by the tube agglutination test and all agglutinated to the titre of the serum employed (see Table II).

In order to simplify the " K " antigen determination for all strains which were " O "-inagglutinable in the living state (as determined by positive reaction to the slide test using " OK " serum and negative on the same test using " O " serum) the slide agglutination test was employed using undiluted " OK "4 serum.

The majority of subsequent haemolytic strains of *E. coli* isolated from " oedema disease " cases were " typable " using this " standard " " OK "4 serum, while the majority of " non-oedema disease " cases were negative.

A further serum was prepared, using a new strain isolated from a pig showing lesions of " oedema disease," which was not typable by the " standard " serum. This strain is referred to as E.57. Several strains from " oedema disease," which were not " typable " with the original serum, were agglutinated by this new serum (E.57).

The final serological results are as follows:—

A. Out of 77 haemolytic strains isolated from " oedema disease " cases (see Table II):—

(1) 61 were " typable " by our " standard " " OK "4 serum. Of these:—

(a) 54 appeared to have the same " O " and " K " antigens.

TABLE II

SEROLOGICAL RESULTS OF 77 HAEMOLYTIC *E. coli* STRAINS ISOLATED FROM CASE OF " OEDEMA DISEASE "

Serological Types		Number of Strains	Slide agglutination test				Tube agglutination test					
			" Oedema Disease " sera			Non-oedema disease serum " OK " 177	" Oedema Disease " sera				Non-oedema disease serum	
			" OK " 4	" O " 4	" OK " 57		" O.K " 4		" O.K " 57		" O.K " 177	
							" O " aggl. titre	" K " aggl. titre	" O " aggl. titre	" K " aggl. titre	" O " aggl. titre	" K " aggl. titre
Typable E.4.	1.a	54 — 11 strains (E.1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11)	+++	—	—	—	1 : 3,200	1 : 400	—	—	—	—
		43 strains (12; 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 30, 32, 33, 34, 35, 36, 37, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 66, 69, 73, 74, 75, 76, 77))	+++	—	—	—	1 : 3,200	" K " antigen determined by slide agglutination	—	—	—	—
	1.b	5 (E.39, 40, 41, 42, 43)	+++	—	—	—	1 : 800	"	—	—	—	—
	1.c	2 (E.67, 68)	—	—	—	—	1 : 800	Nil 1 : 50	Nil 1 : 100	Nil 1 : 100	Nil 1 : 100	Nil 1 : 100
Typable E.57	2.a	3 (E.57, 70, 71)	—	—	+++	—	Nil 1 : 100	—	1 : 800	1 : 100	Nil 1 : 100	—
	2.b	4 (E.58, 59, 60, 72)	—	—	+++	—	Nil 1 : 100	—	1 : 200	1 : 50	Nil 1 : 100	—
Not Typable Our sera	3	9 (E.26, 29, 31, 38, 61, 62, 63, 64, 65)	—	—	—	—	Nil 1 : 100	—	Nil 1 : 100	—	Nil 1 : 100	—

(b) Five strains had a lower " O " titre, but the same " K " antigen.

(c) Two strains, having a different " K " antigen, had a similar " O " antigen, although they agglutinated to a lower titre (these two strains were negative to the slide test with both " OK "4 and " OK "57 sera, but boiled broth cultures agglutinated in a dilution of 1:800 with " OK "4 and " O "4 sera).

(2) Seven strains were typable with the second serum " OK "57:—

(a) Three strains had " O " and " K " titres of 1:800 and 1:100 respectively.

(b) Four strains had lower " O " and " K " titres.

(3) Only nine strains were not " typable " with either of these sera. The strains which showed low " O " titres indicating that " O "-inagglutinability was not affected by heating at 100° C., were autoclaved at 120° C. for two hours, but the titres remained the same after this treatment.

B. Out of the 58 strains of *E. coli* isolated from conditions other than " oedema disease ":—

(1) 54 strains were completely negative to both of the " type " sera (" OK "4 and " OK "57).

(2) Three strains were " typable " by " OK "4 serum, one of which had a different " K " antigen.

(3) One strain was " typable " by " OK "57 serum.

In agreement with the main hypothesis that particular *E. coli* serotypes are involved in certain specific conditions, it is interesting to note that 17 of the above mentioned 58 " non-oedema " strains were typable with a single serum referred to as " OK "177. This serum was prepared using a haemolytic *E. coli* strain isolated from the intestinal contents of a typical case of gastro-enteritis. None of the " oedema disease " strains were agglutinated by this serum. The 17 strains " positive " with " OK "177 serum were isolated from the carcases of pigs showing lesions of gastro-enteritis, with the exception of two which were isolated from cases of septicaemia.

Distribution of E.4 Type of Haemolytic *E. coli* in Outbreaks of " Oedema Disease "

Samples representative of all pigs on such premises were taken by means of rectal swabs (a few were taken direct from fresh faeces). *E. coli* colonies were examined by the slide agglutination test.

Four outbreaks were examined, involving 47 swabs, of which 20 yielded haemolytic strains which were " typable " with " OK "4 serum. Two swabs from non-affected but in-contact pigs were negative.

The " positive " swabs were only obtained from affected pigs or their in-contact pen mates. All 25 rectal swabs from pens not containing affected pigs were negative. In all " positive " swabs there was a marked preponderance of the " type " specific, haemolytic colonies, and in some cases the growth was almost pure.

Distribution of E.4 Type of Haemolytic *E. coli* in Normal Pigs

A survey of the incidence of this particular sero-type in normal pigs from a variety of premises has been commenced. The examination is based on rectal-swab cultures which were tested by the slide agglutination test using " OK "4 serum.

So far, swabs from 106 pigs involving seven different premises and 10 random samples from an abattoir have been examined. The majority of these swabs yielded some haemolytic colonies of *E. coli*, and as many as was practicable were tested.

On plating these swabs, only five yielded colonies which were agglutinable with " OK "4 serum, and these colonies were present in very small number, contrasting markedly with the results of swabbing in outbreaks of " oedema disease." These five " positives " were from two premises on which there was no previous history of " oedema disease."

In one outbreak of " oedema disease " in which positive swabs were found, the residual pigs when swabbed four weeks later, all yielded negative results.

Bacteriological Examination of the Internal Organs of Recently Dead Pigs, Showing Lesions of " Oedema Disease "

A. *Field Cases.* Cultural examination of heart, liver, spleen, and kidneys of recently dead pigs (nine cases) revealed no haemolytic organism.

B. *Experimental Cases (Timoney's type of reproduction).* Cultural examination of intestinal contents and internal organs of four such pigs failed to yield " type " specific organism.

Biochemical Results

Of 77 " oedema disease " strains, all except two (E.62 and 63) produced indole, all were M.R. positive and V.P. negative; all failed to grow in Koser's citrate medium; none produced H_2S or liquefied gelatine. With the exception of one strain (E.61), all failed to decompose urea.

All fermented lactose, glucose, mannitol, and xylose promptly with gas production (only two strains were anaerogenic, E.21 and E.23).

None attacked inositol. Dulcite was not fermented by 33 strains, and with the remainder the fermentation was prompt. Maltose was fermented by 68 strains; 10 strains failed to ferment sucrose. Salicin was fermented by 23 strains in 1 to 4 days.

Discussion

In the past a great deal of controversy has centred around the possible rôle of *E. coli* as a pathogen in man and animals. However, in recent years the development of potent serological methods for differentiating strains of *E. coli* have clearly demonstrated that certain serotypes are commonly associated with specific clinical entities.

Recently, evidence has been produced indicating that a haemolytic *E. coli* is commonly isolated from the intestines of pigs which have died of " oedema disease " (Hudson, Huck & Shand, 1951; Buntain, 1951; Gitter, 1953; Schofield & Davis, 1955).

A volume of evidence is available suggesting that haemolytic strains of *E. coli* show greater uniformity serologically (appear to belong to fewer "O" groups), and are more often "O"-inagglutinable and more commonly pathogenic than non-haemolytic strains (Dudgeon *et al.*, 1921; Knipschildt, 1945a; Vahlne, 1945; Sjöstedt, 1946; Ewertsen, 1946; Kauffmann, 1954).

Ewertsen (1946) concludes that the following characteristics of coliforms are correlated: "O" group, "O"-inagglutinability, origin, toxicity, haemolysis, and necrotising power.

In the work described in this paper, 77 strains of haemolytic *E. coli* isolated in pure or almost pure culture from the intestine or mesenteric lymph nodes of cases of "oedema disease" have been examined.

In these strains a high degree of serological uniformity has been demonstrated. Sixty-eight of the 77 strains can be "typed" using only two "OK" sera. One of these sera can account for no less than 61 of the strains.

These results show a marked contrast to the results obtained with *E. coli* strains from pigs which died as result of conditions other than "oedema disease." Only four strains from 58 examined showed agglutination with the two "oedema type" sera employed.

A small survey in healthy pigs (106 samples) revealed that the incidence of strains agglutinated with the slide test using "OK"4 serum was very low (5), and in these "positive" swabs the number of "typable" colonies per plate was very small. This was in contrast to samples from affected pigs and their apparently healthy, in-contact pen mates which were nearly all "positive" and almost invariably showed a great preponderance of "positive" colonies on plating (out of 22 affected and in-contact pigs—20 were "positive"—the only two "negative" samples were obtained from healthy pen mates).

It appears highly significant that, from all the pigs examined which died of "oedema disease," a pure or almost pure culture of a haemolytic *E. coli* was obtained from the intestinal contents. In the majority of cases, these strains appear to belong to a particular sero-type. The results of rectal swabbing in healthy but in-contact pigs suggest that a high preponderance of the "type" organism is present in the intestine of these pigs.

As far as biochemical tests are concerned, our results with "oedema disease" strains are in general agreement with the observation of Knipschildt, Vahlne, Wramby and Sjöstedt—all of whom contended that there is no definite relationship between the biochemical and serological classification.

The aetiology of "oedema disease" has been the subject of much discussion. The "toxaemia" hypothesis (Timoney, 1950; Schofield & Schroder, 1954) appears to us to be the most acceptable.

Timoney (1950) has demonstrated that it is possible to reproduce experimentally, in pigs, symptoms and lesions of "oedema disease." He used supernatant fluid from centrifuged intestinal contents of affected animals, and also saline extracts of the same material. This observation has been confirmed by Lamont *et al.* (1950), Hudson *et al.* (1951), and ourselves. Lamont *et al.* (1950), showed that filtering through a Chamberland L3 candle did not affect the potency of the material and we have also used bacteria-free material successfully. It would appear that if a living agent was responsible for the activity of the extracts, it must be filtrable. However, it seems unlikely that a living agent is involved since experimental pigs subjected to injection of this type of material may succumb in as little as 16 hours, showing typical symptoms and lesions. (Bacteriological examination of the internal organs of the experimental pigs yielded negative results.) This time interval seems far too short to be accountable as the incubation period of a living pathogen. Further, many attempts to transmit *serially* the experimental condition by the method described above have failed completely (Timoney, 1950; and Lamont *et al.* 1950, and ourselves), again suggesting that a living, transmissible agent is not involved in this experimental reproduction.

Again, on the basis of experiments using a most comprehensive variety of material from affected animals and attempting transmission to susceptible pigs by many routes (Timoney, 1950; Flatla (quoted by Timoney; 1950); Luke & Gordon, 1950), it appears that the condition is not readily transmissible except by using the intestinal material previously mentioned and even then only when relatively large amounts of material are used.

The experimental observations outlined above are, however, quite compatible with the theory, that a non-living toxic agent is present in the intestines of pigs suffering from the "natural" condition.

On the basis of feeding experiments (Timoney, 1950; Luke & Gordon, 1950; Schofield & Schroder, 1954; Hudson, Huck & Shand, 1951) in which feed being used during "oedema disease" outbreaks was fed to susceptible pigs with completely negative results, it appears that the "toxin" is not to be found in the food and therefore it would appear probable that it is formed in the intestine.

The results of our examination of the distribution and character of the haemolytic *E. coli* which appears to be constantly present in the intestines of all cases of "oedema disease" has led us to suppose that this organism plays an essential rôle in the pathogenesis of the condition.

The evidence leading to this supposition is as follows:—

(1) The great majority of strains isolated fall into two main sero-types, one of which is much more common than the other. These strains are not common in pigs which have died of other conditions, or in healthy pigs. This kind of sero-type distribution is common in those conditions found in man and animals which also appear to be associated with *E. coli*.

(2) Furthermore, the organism when isolated from cases of "oedema disease" appears to predominate when plated on sheep's-blood agar, whereas, on the rare occasions on which the same sero-type is isolated from normal pigs it is present only in small numbers.

(3) The extent of an outbreak on a particular farm, as shown by clinical signs, is precisely the same as the distribution of the "type" organism,

i.e. our records so far show that the organism is limited entirely to clinically affected pigs or their in-contact pen mates (usually litter mates).

(4) The failure to isolate the " type " organism either from intestines or internal organs of experimentally reproduced cases (Timoney's type of experimental transmission). It appears to us that an important difference between the experimental case and the natural disease is that, in the latter the organism may elaborate a toxin in the intestine of the pig, whereas in the former, toxin is supplied artificially by intravenous inoculation. Therefore one would not expect to find the organism in the experimental case.

Thus it appears that the idea of this disease being caused by a toxin produced within the alimentary canal is in accordance with the known facts of the disease, and there is a strong likelihood that particular sero-types of *E. coli* are involved in the cycle of events leading to the establishment of the disease syndrome.

The question as to how far it would be reasonable to assume that the organism might be the toxigenic agent must now be examined.

Timoney (1950); Terpstra (quoted by Timoney, 1950); and Luke & Gordon (1950), carried out bacteriological examination of organs of pigs which had died of " oedema disease " with negative results. Our findings are in agreement with these results. The organism appears to be confined to the intestine and mesenteric lymph nodes. It therefore appears that the organism is not invasive in " oedema disease." It could, however, produce disease by the elaboration of a toxin which is absorbed from the intestine by the pig.

Several authorities (Smith, 1927; Ewertsen, 1946; Sjöstedt, 1946; and Kauffman (cited by Sjöstedt, 1946)) are agreed that most *E. coli* strains are of low invasive capacity and that they exert their effect through the amount of toxin produced.

Furthermore, evidence is available showing a relationship between the serology and toxicity of strains of *E. coli*. Thus Sjöstedt (1946), concludes, after examination of the question, that " capsular coli-strains of the same serological type possess a constant toxicity irrespective of the origin of the strain."

It is evident therefore that *E. coli* strains are capable of toxin production and that this capacity is related to serological type.

However convincing the case may appear, the real establishment of the fact that these " oedema disease " strains of *E. coli* can indeed produce the toxin in question must depend upon direct experimental demonstration that the organism is capable of producing such a toxin, preferably *in vitro*, in a suitable medium, and that this toxin is capable of producing symptoms and lesions indistinguishable from those found in the natural syndrome.

An equally essential factor in the pathogenesis of the condition must be the presence of an environment which can precipitate these processes when the organism is present.

Summary

1. Evidence is presented that specific sero-types of haemolytic *E. coli* are associated with " oedema disease."

2. These sero-types appear to be non-invasive and are not common in pigs except in association with " oedema disease."

3. On the basis of evidence presented it seems likely that " oedema disease " is an entero-toxaemia, the " toxin " being produced by these organisms.

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The Experimental Reproduction of a Syndrome Indistinguishable from Oedema Disease

BY

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Introduction

THE aetiology of "oedema disease" has been the subject of a variety of theories, and prominent amongst these has been the "toxaemia" theory suggested by Timoney (1951) and Schofield & Schroder (1954).

Timoney (1951a) presented evidence which he considered "strongly supports the suggestion that the disease is a specific toxaemia, either originating in the bowel or due to ingestion of a preformed toxin contaminating the food."

Evidence was presented by Sojka, Erskine & Lloyd (1957) that certain serotypes of haemolytic *Escherichia coli* are constantly associated with "oedema disease" and that organisms belonging to these serotypes were present in large numbers in the intestine, pure growth often being obtained on culturing large-intestine contents. They suggested that these strains may elaborate toxic material in the intestine capable of producing the clinical signs and *post-mortem* lesions of the disease. Strong supporting evidence in favour of this hypothesis would be provided by demonstration that these serotypes of *E. coli* could, in fact, produce such a toxin *in vitro*. Extracts of cultures of these organisms were therefore prepared and tested by inoculation into pigs.

Methods and Material

Roux flasks containing 0.1 per cent. glucose-agar medium were inoculated from six-hour broth cultures of the organism under test (1.5 ml. per flask) and incubated for 72 hours at 37° C. The growth obtained was washed off with sterile normal saline (10 ml. per flask) and gave a suspension of approximately 120-150,000,000,000 organisms per ml. as calculated by the use of Brown's opacity tubes. The suspension in universal containers, was frozen and thawed 10 times, centrifuged at 12,000 r.p.m. for 30 minutes, and the supernatant carefully transferred to sterile universal containers. By direct plating on sheep-blood agar it appeared that very few organisms remained—approximately 150 per ml. The material was stored at −20° C.

The strains of *E. coli* used in these experiments are those previously described by Sojka, Erskine & Lloyd (1957). The serotypes are as follows:—

1. E. 4. This appears to be the serotype most commonly found in association with "oedema disease" (65.6 per cent. of 130).
2. E. 57. Also frequently found in association with "oedema disease," although very much less frequently than E. 4 (17.6 per cent. of 130).
3. E. 177. This serotype has not been isolated from "oedema disease," but is frequently isolated from cases of gastro-enteritis of pigs.
4. Strains were also used which were isolated from cases of "oedema disease," but which do not belong to either of the above "oedema disease" serotypes (E. 4 and E. 57) or to E. 177.

All experimental pigs were inoculated with extracts intravenously.

Bacteriological examination of internal organs (liver, spleen, heart, and kidneys) and intestinal contents were carried out at *post-mortem* examination by direct plating on sheep-blood agar to detect the presence of haemolytic *E. coli*, but as these examinations yielded consistently negative results from the internal organs and as there were no type-specific *E. coli* present in the intestine in all 10 pigs in the first two experiments, bacteriological examination was discontinued.

Experiments

I. Two pigs of approximately 120 lb. weight were used in this experiment. One was given 10 ml. of extract of strain E. 4 and the other 4 ml. of the same extract.

After 18 hours the first pig (10 ml.) was found recumbent, unable to rise, and was killed *in extremis* two hours later. *Post-mortem* examination revealed no evidence of oedema. Thirty-six hours after injection the second pig (4 ml.) was showing the early clinical signs of "oedema disease"—oedema of the eyelids, reluctance to rise, and staggering on the hind limbs when induced to rise. These signs progressed to intense oedema of the eyelids, oedema of the face and ears, and complete inability to rise at

48 hours. It was slaughtered, and *post-mortem* examination showed marked subcutaneous oedema of face, ears, and eyelids, and the typical oedema of the stomach wall.

II. The experiment was repeated with eight pigs of approximately 100 lb. weight. The same extract (E. 4) was used, and the amount of inoculum varied between 20 ml. and 5 ml. The results are recorded in Table I, from which it will be seen that of the eight pigs inoculated, seven showed some evidence of oedema on *post mortem* and five showed clinical signs typical of " oedema disease."

III. Extracts were prepared from further strains of haemolytic *E. coli* to determine whether they show this ability to produce signs and lesions as described in experiments I and II. These strains may be grouped as follows:—

(a) Other strains belonging to the E. 4 serotype —E. 1 and E. 55.

(b) A strain belonging to the second serotype—E. 57.

(c) Two strains—E. 38 and E. 64—which do not belong to either of the two serotypes mentioned above, but which were isolated from field cases of " oedema disease."

(d) One strain of a serotype never isolated from " oedema disease," but isolated from a case of gastro-enteritis in a pig—E. 177.

A second extract of strain E. 4 was prepared to test the constancy of " toxin " production by the method used.

Details of this experiment are shown in Table II.

In most instances the pigs showed some degree of shock immediately after injection, but in most cases recovered within an hour or two. In some cases this shock was severe, involving vomiting, scouring, and prostration, and was probably the occasion of death in at least two pigs (Nos. 7 and 13).

Discussion

The history, course, clinical signs, and *post-mortem* lesions found in naturally occurring " oedema disease " appear to be specific and show little variation from outbreak to outbreak. Diagnosis is, therefore, usually simple, and there is little chance of confusion with other diseases of pigs.

Sojka, Erskine & Lloyd (1957) found that individual pigs in a group which has shown this distinct clinical and *post-mortem* syndrome and which die during the outbreak always yield pure or almost pure culture of haemolytic *E. coli* of one of a few serotypes from the large intestine, usually also from the mesenteric lymph nodes, but not from other internal organs (liver, kidney, spleen, or heart) at *post mortem*. No evidence was found that the syndrome occurs without the organism being present. This suggests that the syndrome has a constant aetiology.

A condition closely resembling the clinical and *post-mortem* picture has been reproduced by the intravenous injection of extracts of at least three serotypes of haemolytic *E. coli* originally recovered from field outbreaks of " oedema disease." A similarly produced extract of haemolytic *E. coli* of another serotype recovered from a pig suffering from a condition other than " oedema disease " has not produced this syndrome.

This experimental reproduction of a condition indistinguishable from " oedema disease " must be regarded as strong evidence in support of the contention that certain strains of *E. coli* play an essential part in the pathogenesis of the condition, and that

TABLE I

SUMMARY OF RESULTS OF EXPERIMENT II (INTRAVENOUS INJECTIONS OF PIGS WITH *E. coli* EXTRACT " E.4 ")

Pig No.	Amount injected	Symptoms at 24 hours	Symptoms at 48 hours	*Post-mortem* lesions
1	20 ml. intravenously	Eyelids oedematous. Listless.	Marked oedema eyelids. Paralysis fore and hind limbs. Killed after 48 hours.	Oedema mesocolon, eyelids and face.
2	15 " "	Collapsed and lying on side. Paddling movements of limbs. Died within 24 hours.	—	Congestion of carcase and visceral lymph nodes. No evidence of oedema.
3	15 " "	Found dead after 17 hours.	—	Slight oedema stomach wall.
4	10 " "	Ears and eyelids slightly swollen.	Marked oedema eyelids and ears. Killed.	Oedema of face, eyelids and ears. No oedema in other sites.
5	7 " "	Oedema of eyelids; inco-ordination hind limbs.	Marked oedema of eyelids; killed *in extremis*.	Marked and extensive oedema of the stomach wall. Oedema of face, and subcutaneous tissue in inguinal region.
6	7 " "	Inco-ordination hind limbs.	Recovered. Killed on 4th day.	Oedema of the stomach wall and superficial inguinal lymph nodes.
7	5 " "	Slight oedema of eyelids.	As at 24 hours. Killed.	Slight subcutaneous oedema of face and eyelids; excess of peritoneal fluid. No oedema in other sites.
8	5 " "	Nil.	Nil. Killed at 48 hours.	Marked oedema of stomach wall and mesocolon.

Pig No. 1, Table I, at 48 hours, showing oedema of eyelids and ears.

Pig No. 10, Table II. Oedema may be seen bulging from cut surface at bottom of photograph.

Stomach wall Pig No. 5, Table I, showing gelatinous oedema beneath cut surface.

Pig No. 1, Table I. Skin has been removed from right side of face to show subcutaneous oedema (arrowed).

TABLE II

SUMMARY OF RESULTS OF EXPERIMENT III (INTRAVENOUS INJECTION OF PIGS WITH EXTRACTS OF VARIOUS STRAINS OF HAEMOLYTIC *E. coli*)

Pig No.	Extract of strain	Serological type	Origin	Amount injected	24 hours	48 hours	*Post-mortem* lesions
1	E. 4	E. 4	Oedema disease	20 ml.	Dead.	—	Oedema stomach wall.
2	E. 4	E. 4	„	15 ml.	Oedema of eyelids.	Hind limbs incoordinated. Killed.	Oedema stomach wall, larynx, ears, eyelids and face.
3	E. 4	E. 4	„	10 ml.	Oedema of eyelids.	Oedema of eyelids and ears. Hind limbs inco-ordinated. Killed.	Marked oedema, stomach wall, slight oedema mesocolon, larynx, face, ears and eyelids.
4	E. 4	E. 4	„	5 ml.	No change.	No change.	No evidence of oedema.
5	E. 1	E. 4	„	10 ml.	Oedema of eyelids.	Marked oedema eyelids. Hind limbs incoordinated. Killed.	Marked oedema stomach wall and mesocolon. Oedema larynx, ear, face and eyelids.
6	E. 1	E. 4	„	5 ml.	Dead.	—	Oedema stomach wall.
7	E. 55	E. 4	„	10 ml.	Died soon after injection.	—	No evidence of oedema
8	E. 55	E. 4	„	10 ml.	Unable to rise. Oedema of eyelids and ears.	Killed *in extremis*.	Marked oedema stomach wall.
9	E. 57	E. 57	„	15 ml.	Dead.	—	No evidence of oedema.
10	E. 57	E. 57	„	10 ml.	Dead.	—	Oedema stomach wall.
11	E. 38	Not typable	„	15 ml.	Dead.	—	No evidence of oedema.
12	E. 38	„	„	10 ml.	Inco-ordination fore and hind limbs. Oedema of eyelids	Killed *in extremis*.	Marked oedema stomach wall.
13	E. 64	„	„	10 ml.	Died shortly after injection.	—	No evidence of oedema.
14	E. 64	„	„	8 ml.	Inco-ordination fore and hind limbs.	Killed *in extremis*.	Marked oedema stomach wall.
15	E. 177	E. 177	Gastro-enteritis	25 ml.	Dull.	No change. Killed for P.M.	No evidence of oedema.
16	E. 177	„	„	20 ml.	Dead.	—	No evidence of oedema.
17	E. 177	„	„	15 ml.	Dull.	Recovered. Killed for P.M.	No evidence of oedema.
18	E. 177	„	„	10 ml.	Dull.	Recovered. Killed for P.M.	No evidence of oedema.

" oedema disease " is, in fact, an enterotoxaemia arising from this source.

It seems likely that the toxic material produced *in vitro* by these particular strains of *E. coli* is the same as the toxic material which Timoney (1950) and others have shown to be present in the intestines of natural cases of the disease.

Conclusions

1. It has been found possible to produce in 13 pigs a condition indistinguishable from " oedema disease " in respect of the clinical signs and *post-mortem* lesions by the intravenous injection of an extract of one serotype of haemolytic *E. coli* isolated from a field outbreak of " oedema disease."

2. Extracts of other serotypes of haemolytic *E. coli* isolated from field outbreaks of " oedema disease " have also been found to produce this condition, whereas it was not found possible to produce it by the intravenous injection of a similarly prepared extract of haemolytic *E. coli* from a disease condition of pigs other than " oedema disease."

Acknowledgments.—We wish to acknowledge the help and encouragement of Dr. A. W. Stableforth, Mr. N. Dobson, Dr. G. Slavin, and Mr. J. L. McGirr during the course of this work. We wish to thank Messrs. J. T. Done and R. M. Loosmore for support in initiating this investigation. Also several members of the staff at Weybridge—Dr. A. B. Paterson and Messrs. R. A. Huck, J. D. J. Harding, M. Gitter, W. E. Parish, and E. C. Wright—and the members of the Veterinary Investigation Service who kindly sent cultures and interested themselves in this work.

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The Application of Bemegride* in Pentobarbitone Anaesthesia in the Dog and Cat

BY

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Introduction

THE use of pentobarbitone as a general anaesthetic in veterinary surgery is now firmly established. Surgical operations on dogs and cats may be carried out quite readily under the anaesthesia produced by a dose level of 1/5 gr. per lb. (approx. 30 mg. per kg).

There are, however, two factors which militate against the complete efficacy of pentobarbitone and indeed other barbiturates. These are :—

(i) The minimum dose required to produce adequate surgical anaesthesia, *i.e.* 30 mg. per kg. of pentobarbitone renders cats unconscious for four to five hours, and dogs for five to six hours. This is generally far longer than is required for surgical purposes. Furthermore, it adds to the surgical risk, for an animal in this condition may suffocate through inhalation of vomitus and is susceptible also to hypostatic pneumonia.

(ii) There is always a danger of respiratory arrest from overdosage, either by accidental administration or from sensitivity to barbiturate which is encountered in some animals.

In an endeavour to overcome these disadvantages, the use of the barbiturate antagonist Megimide (N.P.18, β-ethyl-β-methyl glutarimide) was investigated in dogs and cats.

This compound was first used in human medicine by Shaw *et al.* (1954) and this report of its ability to lighten the coma of patients poisoned with barbiturates has been confirmed by numerous other authors, amongst whom are Perinpanaygam (1955), Holten (1955), and Harris (1955). Megimide has also been used to terminate normal surgical anaesthesia after patients have been returned to the ward (Bentel, 1956).

In the veterinary field, Turner & Hodgetts (1956) have shown that Megimide effectively shortens the sleeping time of adult Merino sheep anaesthetised with pentobarbitone and also revives sheep which have been apnoeic for as long as two minutes. Therefore, it seemed important to investigate the use of this compound in cats and dogs anaesthetised with pentobarbitone.

The purpose of this paper is to describe the successful use of Megimide in lightening pentobarbitone anaesthesia in cats and dogs, and, in conjunction with artificial respiration, in reviving such animals deliberately overdosed with this anaesthetic until they ceased breathing.

Experimental

In the earlier work on human barbiturate intoxication, Shulman and his collaborators (1955) combined 2 : 4 diamino-5 phenyl thiazole HCl (Daptazole)† with Megimide in the belief that the two drugs acted synergistically. Daptazole was originally introduced as a morphine antagonist (Shaw & Bentley, 1952). In several of the experiments outlined below, Daptazole-Megimide mixtures have been compared with Megimide alone and no differences in response observed. Consequently, the use of Daptazole in veterinary anaesthesia induced by barbiturate alone‡ is not considered necessary, although further work is needed to establish finally its relative importance in this field. This result is in accord with the finding of Turner & Hodgetts.

We have investigated the action of Megimide for two purposes :—

(i) The lightening of anaesthesia ;

(ii) Resuscitation of apnoeic animals.

In all experiments the barbiturate used was sodium pentobarbitone. Experiments involving both cats and dogs will be outlined.

1. *The Lightening of Anaesthesia*

An experiment involving 25 dogs was performed to determine the efficacy of Megimide in aqueous solution in curtailing anaesthesia. These comprised three litters of eight, six and four dogs, and seven other dogs. The group was of mixed breeds, but the most commonly occurring strains were Australian cattle dogs and terrier crosses. The dogs were distributed randomly into three groups, taking account of sex and litter sizes as far as possible. These were :—

(i) A control group which received the normal anaesthetic dose of sodium pentobarbitone ;

(ii) A group which received the anaesthetic and then, one hour later, Megimide in aqueous solution at a dose of 20 mg. per kg ; and

(iii) A third group which received the anaesthetic and then, one hour later, a solution containing Megimide and Daptazole, both at 20 mg. per kg.

As stated previously, no differences were noted between groups (ii) and (iii). These will therefore be considered together. There are thus seven dogs as controls and 18 receiving Megimide.

Immediately after injection of Megimide the dogs "woke up" and responded to stimuli. In fact, in some cases the full injection was not given as the animal was aroused and started mild twitching after it had

* Megimide Nicholas Products.

† Daptazole is the registered trade name of the Nicholas brand of Amiphenazole A.P.F.

‡ The position of Daptazole as a morphine antagonist has prompted further experiments in anaesthesia induced partly by morphine-type drugs. This will be the subject of a later communication.

received 10 to 15 mg. per kg. Most of these could sit, three could stand. All of these, however, relapsed into sleep. They could be roused without much difficulty from this sleep. The average overall sleeping times, *i.e.*, the time taken from induction to standing, were :—

Controls ... 216 minutes
Treated ... 205 „

This, and other similar experiments with dogs, indicated that (*a*) Megimide will arouse dogs from sodium pentobarbitone anaesthesia. However, after about 30 minutes the animals return to a light sleep. The overall sleeping time is not significantly diminished ; (*b*) Daptazole does not alter this response ; and (*c*) animals treated with Megimide showed no subsequent abnormal symptoms.

Similar results were obtained with cats. Arousal was produced in six cats anaesthetised with sodium pentobarbitone at 30 mg. per kg., but regression occurred. However, in this case there was a shortening of the average sleeping time from approximately five to approximately four hours. As with dogs, about 15 mg. per kg. Megimide in aqueous solution was used ; higher doses (20 to 30 mg. per kg. caused convulsions.

2. *Resuscitation of Apnoeic Animals.*

Nineteen dogs were slowly injected intravenously with sodium pentobarbitone until apnoeic (the usual level was about 50 to 60 mg. per kg.). They were then injected with Megimide in aqueous solution at 20 mg. per kg. The animals were again divided into three groups, which received :—

(i) Megimide only ;
(ii) Artificial respiration only ;
(iii) Megimide and artificial respiration together.

In group (i) (five dogs) all animals died.

In group (ii) (seven dogs) all could be maintained with artificial respiration for periods of 10 to 45 minutes. When this was stopped, none was able to resume spontaneous breathing without further treatment. Three were untreated and died ; the other four were given Megimide 15 mg. per kg., and they recovered.

In group (iii) (seven dogs) all were given Megimide 15 mg. per kg. one minute from cessation of breathing followed immediately by artificial respiration. Five of these dogs recovered. The two fatalities were dogs which had been given the barbiturate rapidly.

To investigate the effect of speed of injection, three dogs were given sodium pentobarbitone rapidly (5 to 10 minutes) and three slowly (20 to 30 minutes), in doses sufficient to produce apnoea. Those induced slowly could be recovered with Megimide-artificial respiration treatment ; the others could not.

Dogs revived in this way usually slept for about 24 hours, and then recovered uneventfully. No abnormalities were observed during the following week.

Cats rendered apnoeic with pentobarbitone responded somewhat differently :—

(i) Megimide only—six cats. All died.
(ii) Artificial respiration only—three cats. All of these recovered after artificial respiration of about 5 to 10 minutes.

In the case of dogs, artificial respiration alone is not likely to be effective. However, when combined with Megimide, 100 per cent. recovery could be obtained when the anaesthetic was not given too quickly. (This would be the condition of an animal which stopped breathing during an operation.)

In the case of cats, artificial respiration alone seems to be effective. There is no apparent advantage to be gained from the administration of Megimide.

Since Megimide is soluble in water only to the extent of 0·5 per cent., the major problem in these experiments was the large volume of liquid necessary to supply the desired dosage of Megimide. This becomes serious when recovery from apnoea is being attempted, and therefore other solvents than water were considered. The most obvious seemed to be propylene glycol. Accordingly, a 3 per cent. solution of Megimide in propylene glycol was used. This gave similar responses to aqueous Megimide, but was difficult to inject on account of its high viscosity. A less viscous mixture was then tried, containing 2·5 per cent. Megimide in alcohol-propylene glycol-water solution (1 : 1 : 1). This was more suitable for injection and produced the desired Megimide responses. However, both solutions seemed less effective than aqueous Megimide in arousing apnoeic animals, due perhaps to their viscosity. In one case with propylene glycol, a pronounced haemoglobinuria was produced.

Neither of these solutions could be said to be satisfactory from the viewpoint of the volume desirable for injection.

At this stage, the sodium salt of Megimide (Sodium Megimide) became available. With this compound we were able to obtain a five per cent. solution, *i.e.* a ten-fold increase in concentration. Experiments in small animals indicated that this compound was quite as effective as its parent. This was confirmed in larger animals. Thus six cats were anaesthetised with 30 mg. per kg. sodium pentobarbitone intravenously. Three of these were given 15 mg. per kg. Sodium Megimide one hour after induction. These responded by raising their heads. Full arousal occurred half an hour later and they were able to walk five hours later. In contrast the control animals did not awaken for three and a half hours and could not walk for another three and a half hours (see Table).

TABLE
EFFECT OF SODIUM MEGIMIDE ON THE SLEEPING TIME OF CATS ANAESTHETISED WITH PENTOBARBITONE

	Barbiturate alone	Barbiturate + Sodium Megimide
Time to arousal	3·5 hr.	1·5 hr.
Time to standing	> 7 hr.	6·5 hr.

It is obvious that Sodium Megimide has the same action as Megimide itself. The effect of Sodium Megimide and artificial respiration in reviving apnoeic dogs was also investigated, and two dogs were successfully treated by this method.

Solutions of Sodium Megimide, like sodium pentobarbitone, are strongly alkaline (*p*H 11 to 12). Sodium Megimide hydrolyses in solution and cannot be kept,

for practical purposes, longer than one hour. As the compound is stable as the solid, however, and is readily soluble, this is not a real disadvantage. Although the possibility of extra-vascular injection is unlikely in an anaesthetised animal, an experiment was performed to determine the possible effects of subcutaneous or intramuscular injection. In three guinea-pigs the right hind leg was injected with 0·5 ml. of a solution of Sodium Megimide at a dose of 30 mg. per kg. subcutaneously. In the left leg sodium pentobarbitone was similarly administered. The experiment was repeated in three more guinea-pigs, the injections being given intramuscularly. All animals were killed 48 hours later and examined. In no case was any abnormal reaction noted.

Discussion

In these experiments we have shown that Megimide can be used in veterinary anaesthesia for healthy dogs and cats. Veterinary clinical trials are needed to determine the generality of these results in animals presented for surgical treatment. Turner & Hodgetts have shown that the compound is also effective in sheep. It therefore seems likely that it can be used generally in animal anaesthesia. From these experiments it would seem advisable to administer Sodium Megimide at the end of operational procedures. This gives an immediate picture of the animal's condition and by lessening the period of coma increases the chance of recovery. The use of Sodium Megimide to recover apnoeic animals is also advisable.

Summary

The use of single injections of Megimide following barbiturate anaesthesia has been investigated in healthy cats and dogs. The following effects have been demonstrated :—

(1) Full surgical anaesthesia is immediately terminated, and the animals usually awaken. Relapse to a light sleep usually occurs, and because of this, the total sleeping time is not significantly reduced.

(2) Animals deliberately overdosed with pentobarbitone until apnoeic may be revived if artificial respiration is also applied for a few minutes.

Twenty cats and 60 dogs have been used ; it is suggested that the use of Megimide could be extended to other species.

The substitution of Sodium Megimide is indicated to overcome the problem of large-volume injections.

The use of Daptazole in veterinary anaesthesia as an adjunct of Megimide appears unnecessary.

Acknowledgment.—The authors wish to record their appreciation of the technical assistance of Ruth D. Macfarlane.

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A Bull-ringing Instrument

BY
SIDNEY S. NYE
Romford

WHEN I took over this old-established practice from the late Mr. Ralph Bennet in 1946, I found quite a number of interesting instruments which I had not previously heard of, one of which I would like to bring to the notice of the profession as I find it most useful. It is an instrument for ringing a bull with a hot iron, and it has several advantages to recommend it. The instrument is inserted in the bull's nose, as one would a pair of Bull-dogs, and a hot iron is passed through the tubes which are attached at right angles to the nostril end. The advantages are:—

(1) The bull remains under proper control during the operation and the hole is made in the proper place.

(2) There seems to be no pain at all during the insertion of the hot iron.

(3) There is never any haemorrhage.

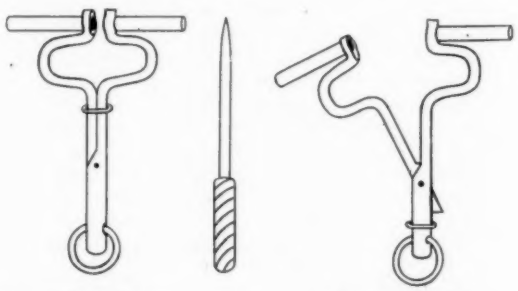
(4) There is no granulation of the wound and it remains patent throughout the bull's life, allowing the easy insertion of a fresh ring if necessary.

(5) The instrument never gets blunt and makes a clean hole every time.

(6) By unscrewing the tubes it becomes a useful pair of Bull-dogs.

The only disadvantage is that a fire is necessary, but that is nearly always obtainable on any farm to-day.

I do not claim this instrument to be unique but sufficiently uncommon to warrant reporting.



Bullringer ready for insertion of hot-Iron. Iron. Bullringer opened to place in bulls nose.

WORLD HEALTH DAY, 1957

The theme chosen by the World Health Organisation for this year's World Health Day is nutrition. So far as this country is concerned arrangements are being made for a public meeting to be held in the Beveridge Hall, London, on April 6th, at which the Minister of Health will speak.

Current Literature

BOOK REVIEW

The Status of Animals in the Christian Religion. By C. W. HUME (with marginal sketches by Fougasse). London : UFAW. 8s. 6d. net.

The writings of theologians do not always help in the understanding of the teachings of the Bible and this applies especially to what Jesus taught. The author has set out to examine why so little attention has been given by theologians to the welfare of animals. The beneficence of God is symbolised by the care of a shepherd for his sheep and there are numerous other examples of this kindly attitude towards animals. The fourth commandment demands rest for beast as well as for man and it appears as if Jesus did not feel it necessary for Him to give specific commands on kindness to animals. Oxen were not muzzled when they " trod out the corn " and an ox or an ass which had fallen into a ditch would be rescued even on the Sabbath day. Sparrows, even, were not forgotten by the Heavenly Father.

This neighbourliness to animals received a serious setback in the early Christian era and the author blames Greek rationalism and its intellectual pride which was inimical to Christianity and to science alike. It was responsible for the decline of scientific thought and research in those early days ; Christianity was not culpable. Christians were persecuted and the West invaded by barbarians, and a remnant of culture was saved in the monasteries. The rebirth of science and of a more kindly attitude to animals is due in no small measure to the preservation of such an outlook by the early Christians. Though animals be less intelligent, less valuable, less highly esteemed and less important than human beings, they are entitled to this neighbourly attitude, and this is still denied them. Jesus told the story of the good Samaritan and was kind to publicans and sinners and it seems as if the duty of good-neighbourliness is not conditioned by the esteem in which an object is held.

The gospel of Jesus tells us that all creation awaits redemption into a state in which the will of God is done. Animals could become aware of the reign of God when those human beings, who deal with them, do so in accordance with God's good will. Preaching the gospel to every creature may thus be a more literal command than we at first envisage.

The unfolding of such a story is not an easy job and the author has approached it with courage. Animals are slaughtered for food and used for experimental purposes and these aspects are discussed coherently in the light of the main thesis. Metaphysical, statistical and theological terms are used freely and this makes for deliberate reading ; the honest reader needs a dictionary and is surprised at the catholic erudition displayed. The sketches by Fougasse are a delight ; they are of animals mentioned in the Bible and each has its Biblical reference.

Most of us must examine ourselves from time to time, and, because of our job, we must ponder over the mixed approach we have towards animal life. A study of this small volume may help us in our ponderings ; it may lead us nearer to those teachings which theologians have obscured.

ABSTRACTS

Clinical Use of a New Nitrofuron Dosage Form in Retained Placenta Syndrome in Cattle. JONES, F. B., BELLOFF, G. B., & ROBERTS, H. D. B. (1956). *Vet. Med.* **41.** 413–5.

This is a clinical report on the use of a new agent, " Furea " (finely ground nitrofurazone (Furacin ; Nefco) 1·45 per cent., and powdered crystalline Urea 98·55 per cent.), in the treatment of uterine disorders in cattle with special reference to retained placenta. The results quoted relate to 15 unselected, consecutive cases, all of which had retained their placentae for at least 24 hours, and whose subsequent breeding history was known.

Treatment consisted of the insertion of 9 to 12 g. (bougies) " furea " into the respective horns of the uterus. This was sometimes repeated in 96 hours with, in two cases only, sulphamezathine and/or acriflavine 0·1 per cent. solution. The best results were obtained when manual removal of the placenta had failed. In all cases there was a rapid improvement in bodily condition, and an absence of the commonly associated bad odour. This it is claimed was due to the addition of the urea. Fertility was unimpaired in all cases.

It is thus concluded that this treatment is " a valuable practical and effective adjunct in the professional management of retained placentae in the cow."

(Abstractor's note : It would seem that this preparation merits a clinical trial.)

W. T. R.

Flexor Spasm Syndrome in the Carnivore : I. Review of its Occurrence in the Literature as " Canine Chorea." II. Occurrence in a Tiger (*Felis tigris*). III. Further Observations in Dogs. I. WHITTIER, J. R. ; II. WHITTIER, J. R., & GOSS, L. J. ; III. WHITTIER, J. R. (1956). *Am. J. vet. Res.* **17.** 720–32.

A comprehensive historical account is given of the condition in dogs usually referred to as " chorea." Previous work has shown that the spasmodic twitching of a limb persists following transection of the spinal cord and that the character of the movement is quite unlike choreiform movements in man.

The occurrence of the syndrome, referred to by the author as the " flexor spasm syndrome," is described in one tiger and six dogs. Physiological and pathological studies were made. The muscular contractions were involuntary, repetitive, of short duration and involved flexor groups in the limbs and muscles of the abdominal wall and neck. The contractions varied between the animals in respect of localisation, frequency, amplitude and force. The movements persisted during sleep. There was paresis and atrophy of affected muscles.

The author suggests that the flexor syndrome is a sequel to disease of the spinal cord and compares the manifestations with flexor spasm in man (which results from severe damages to the cord). In man, however, the flexor spasm requires an external stimulus and the elicited movement is not repetitive.

It should be noted that none of the animals presented in this account showed spasmodic contraction of the temporal muscles.

A. C. P.

Infectious Bronchitis. DE GARIS, J. (1956). *St. vet. J. Minist. Agric. Lond.* **11.** No. 33. 67–9.

Infectious Bronchitis in Poultry

In the outbreak described by the author the disease first showed itself as a mild coryza among some battery birds. These exhibited slight sneezing, watery eyes and yellowish or watery droppings tinged with white. Affected yearling birds showed inappetence for about two days and were off lay for about two weeks, but the younger pullets were ill for at least four days and out of production for two months. H.I. tests for evidence of Newcastle disease gave negative results.

The eggs of the recovered birds tended to be soft-shelled or misshapen, with abnormal, watery yolks. At one time, 90 per cent. of the eggs were affected in this way. Similar misshapen eggs were laid by later batches of pullets although these had shown no respiratory symptoms. A 10 per cent. mortality occurred in the young chicks. These were listless and unthrifty, but no respiratory symptoms were noticed.

The identity of the infection was established by means of a serum neutralisation test and the owner was advised to depopulate the premises and to disinfect before restocking.

The Diagnosis of Infectious Avian Encephalomyelitis. MARKSON, L. M. (1956). *St. vet. J. Minist. Agric. Lond.* **11.** No. 33. 38–41.

Infectious avian encephalitis (IAE) is typically seen in chicks two to six weeks of age. The affected chicks show a progressive leg weakness, finally lying helpless on their sides. If they are able to reach the troughs the affected birds will continue to eat, and the less severely affected ones will recover. In the later stages a fine muscular tremor may be present. The incidence of the disease in the flocks studied by the author has varied from 5 to 50 per cent. It did not appear to spread by contact from one batch to another.

Under the heading of differential diagnosis the author mentions bumble foot, arthritis, rickets, Newcastle disease, encephalomalacia, curled toe paralysis (riboflavin deficiency) and neural lymphomatosis. In contrast to cases of infectious avian encephalitis most cases of encephalomalacia exhibit macroscopic areas of haemorrhage or necrosis in the cerebellum. Chicks with curled toe paralysis usually respond within a day or so to the use of a general vitamin B supplement.

Infectious avian encephalitis does not produce gross macroscopic lesions and the laboratory confirmation of a clinical diagnosis rests on the histological examination of the brain, spinal cord and various visceral organs. To obtain material for laboratory examination a sick bird should be killed by the injection of a pentobarbitone such as Nembutal, and the brain, lumbar spinal cord (still within the vertebrae) and portions of the proventriculus, gizzard and pancreas preserved in 10 per cent. formol-saline.

E. A. G.

News and Comment

R.C.V.S. COUNCIL ELECTION

We are informed that six nominations have been received for the five vacancies on the Council of the Royal College, to be filled at the Annual General Meeting on June 5th. The ballot papers are being sent out to all members, we understand, about the end of this week, and we propose to publish brief particulars regarding each of the candidates next week. They are:—

Anderson, L. G., Aylesbury, proposed by E. W. Pocock and John Gray.

Atkinson, G., Exeter, proposed by A. M. Graham and F. Beckett.

Lovell, R., London, proposed by H. W. Dawes and S. F. J. Hodgman.

Mitchell, T. M., Stocksfield, proposed by G. F. Brown and G. R. Taylor.

Montgomerie, R. F., Beckenham, proposed by E. R. Callender and J. McC. Ingram.

Stewart, T., Edinburgh, proposed by F. Alexander and A. Marr.

It is understood that the President of the Royal College, Professor L. P. Pugh, who is one of the retiring members of Council, is not standing for re-election as he has been nominated as representative of the University of Cambridge to sit on the Council for four years from June 5th, 1957.

+ See Errata - p. 325

OEDEMA DISEASE

Two papers on this subject, written by workers at Weybridge, take up the larger proportion of the space in this week's issue devoted to clinical and research matters. The papers are published together as they are complementary, and the subject matter is of notable importance. It may be recalled that, in a paper delivered to the Association's Annual Congress at Belfast in 1955, Gracey (*Vet. Rec.* **67.** 988) surveying pig losses found that 39.6 per cent. of post-weaning losses among the herds sampled were due to gut oedema. Thus the two papers published on other pages of this issue should command the attention of clinicians and research workers alike.

A BIT DULL

It is painful to draw attention to a letter published this week, from the wife of a veterinary surgeon. The sting does not lie, as is usual in communications from ladies, in the tail, but in the head—indeed, in the opening words. "I always find THE RECORD a bit dull," she writes.

We are not thin-skinned. Only recently we weathered, as best we might, a minor gale of criticism concerning the content of this journal. But that was different. There is—at least there is supposed to be—something dignified, something noble, even, in marching breast forward and defying the lightning. There is no defence, moral or material, against being a bit dull. It is an expression used in summing up husbands; in assessing country cousins; in sampling

inferior wine. The stark simplicity of those three monosyllables gives to them a kind of finality; they have an obituary ring even had the word " always " not been added for good measure.

People were not flattered when Carlyle referred to his fellow countrymen as " mostly fools "; yet even that was to be preferred. A bit dull. That is, really, a bit much!

IN PARLIAMENT

Pig Progeny Testing Stations

MR. B. HARRISON (February 21st) asked the Minister of Agriculture, Fisheries and Food what progress has been made with the construction of the pig progeny testing stations; and when he anticipates these will be in operation.

MR. AMORY: The station at Selby should start full operations in June; those at Corsham, Letchworth, and Sealand should all be ready to begin operations in October. I understand that the construction of the Scottish station at Bridge of Allan has begun and that it should be completed by the middle of next year.

Pigs (Virus Pneumonia)

MR. CROUCH asked the Minister of Agriculture, Fisheries and Food, as representing the Lord President of the Council, if he will make a statement on the research into virus pneumonia in pigs.

MR. AMORY: Recent research has shown that a number of different causes give rise to the condition known as virus pneumonia in pigs. These are being studied at the Department of Animal Pathology, Cambridge, the Agricultural Research Council's Field Station, Compton and at the Glasgow University. Other animal research institutes are building up virus-free herds of pigs free from all symptoms of this condition.

MR. DE FREITAS: Is it not a fact that the figures which the Minister has given recently about the amount of public money spent on research into pig diseases is very small compared with the losses each year to the industry from diseases?

MR. AMORY: The limitation at present in this matter of research, as in most other matters of agricultural research, is not so much a financial limitation as one which arises from the scarcity of qualified men able to devote themselves to the research. I should be glad to see the scale of this research work expanded.

UNIVERSITY NEWS

Bristol

Dr. D. E. Kidder, B.SC., has been appointed lecturer in Chemical Pathology (Veterinary).

Liverpool

The annual ball of the Liverpool University Veterinary Society was held in the Students' Union on February 22nd, from 8 p.m. until 2 a.m. with dancing to Garry Barker and his Orchestra. Those attending included members of the teaching staff and a number of members of the profession from the area.

Decorations, the work of Mr. D. H. Neil of the third year and a number of assistants, were on an " Arabian Nights " theme, and the general organisation of the ball was in the hands of Mr. J. B. Schofield of the third year. The master of ceremonies was Mr. J. D. F. Barnes of the third year. During the evening an entertainment was provided by the celebrated Liverpool Punch and Judy Show under the direction of " Professor " Codman.

The officers and members of the Society are to be congratulated on all that they had done to make the event such a success.

LEGAL NOTES

Mr. Charles L. Corbett of Broseley, Shropshire, was recently committed to prison for seven days for failing to attend at Wellington County Court on February 19th when a veterinary surgeon claimed a debt of £10 12s. 6d. from him on a judgment summons. Judge D. Eifion Evans said it did not seem sufficiently known by judgment debtors that since the beginning of the year there had been a new procedure for enforcing attendance at county court. Hitherto a rather cumbersome procedure had been necessary involving more than one application to the court on the part of the judgment creditor. Under the Administration of Justices Act, 1956, a judgment creditor could now apply to the judge for the attendance of the debtor at the next court. If the debtor, having been paid or tendered conduct money when the summons was served, did not attend on the next occasion he could be sent to prison.

In the Queen's Bench Division recently, judgment was given for the defendants in a case where a cow in their possession had knocked down the plaintiff on a pedestrian street crossing. In giving judgment Mr. Justice Stable (quoted in *The Times* law report) said that after running from the market the cow turned into a cul-de-sac where, if people had only acted with half as much intelligence as the average cow in circumstances of this kind, it could have been safely retrieved. But a number of people stood on a wall shouting and waving their arms with the object of creating as much disturbance in the cow's mind as they could. The cow, accustomed to the tranquillity of the farm, became more and more frightened. It turned into the High Street, where it trotted along in a staid manner.

The cow, however, unacquainted with the regulations relating to zebra crossings, did seem to recognise a policeman when it saw one. He held out his hand and gave it the appropriate signal whereupon it turned into a car park. Hearing a motor-horn, the cow broke through a cordon and out of the car park. Before it was shot it went over the zebra crossing and knocked down the plaintiff.

His Lordship was satisfied that the cow had never shown any vice. By the time it knocked down the plaintiff it had been driven frantic by the misguided efforts of human beings and had become dangerous. Its collision with the plaintiff was not a vicious attack; he happened to be in its way.

He (his Lordship) had come to the conclusion that every proper precaution was observed in unloading the animal, and that disposed of the case. There was no negligence by either of the defendants.

LETTERS TO THE EDITOR

There has been a welcome increase lately in the number of letters to the Editor. For a number of readers this is the most interesting section of the journal and it is hoped that members of the profession will write to us freely. Letters of clinical interest are particularly welcome and so are those of a lively, controversial nature. THE VETERINARY RECORD aims to try to reflect not only the skill and learning of the profession, but also the climate of its current opinion on the widest range of topics. Letters to the Editor are the best possible way of achieving the latter.

MILK MARKETING BOARD APPOINTMENTS

The Milk Marketing Board of England and Wales have lately appointed three Deputy Regional Veterinary Officers, one to each of their Northern, Midland, and Eastern Regions.

Mr. M. A. Couttie, M.R.C.V.S., who has been in the Board's Northern Region as Assistant Veterinary Officer for some years, will now reside at York A.I. Centre, while Messrs. Forteath, M.R.C.V.S., and Bownass, B.SC., M.R.C.V.S., both new members of the staff with extensive experience in general practice over many years, are now in residence at Little Horwood and Sutton Bonington A.I. Centres respectively.

AREA ERADICATION PLAN FOR TUBERCULOSIS

The Minister of Agriculture has made Orders declaring three new tuberculosis eradication areas in England and Wales. The Secretary of State for Scotland has made an Order declaring a new tuberculosis eradication area in Scotland. These Orders came into force on March 1st.

Since March 1st, 1955, free tuberculin tests have been provided in four areas, as follows:—

Berkshire, Hampshire, Isle of Wight, Surrey, West Sussex, and parts of Buckinghamshire and Oxfordshire.

Parts of the North and West Ridings of Yorkshire.

Anglesey and Caernarvonshire and part of Denbighshire.

The counties of Orkney, Caithness, Sutherland and Nairn, and parts of the counties of Inverness, Ross and Cromarty, and Moray.

With the help of free tuberculin tests, most of the herds in these areas that were not then attested have since qualified for entry to the voluntary Tuberculosis (Attested Herds) Scheme and for bonus payments under that Scheme.

JERSEY COWS SAILED IN THE " MAYFLOWER "

Four pedigree Jersey calves are on their way to America to mark the 350th anniversary of the founding of the first English settlement at Jamestown, Virginia, in 1607.

They will come from Scottish herds and have been presented by the English Jersey Cattle Society.

Jerseys were the first dairy breed to be introduced into America. They sailed on the original *Mayflower*.

It is hoped that President Eisenhower will receive the calves on behalf of the American dairy industry.

THE REGISTER OF VETERINARY SURGEONS

Under Section 25 (3) of the Veterinary Surgeons Act, 1948, and the provisions of Statutory Instrument No. 1150 of 1953, the names of the undermentioned were removed on February 14th, 1957, at their own request, from the appropriate Registers:—

Register of Veterinary Surgeons

Affleck John McGilvray, Box 303, Rt. 1, Bedford, Virginia, U.S.A.

Supplementary Veterinary Register

Newman Edward Parker, The Retreat, Stonham, Stowmarket, Suffolk; Robert Bull Sheen, Cambridge House, Town Lane, Stanwell, Middlesex; and Mrs. Vida Matilda Wagner, Liberty Hall, Brookshill Drive, Harrów Weald, Middlesex.

RUSSIA BUYS BRITISH LIVE-STOCK

Russia has paid about £50,000 for two consignments of pedigree British live-stock bought during a three-month tour of this country by Soviet Government experts.

They were bought from 33 different breeders after stringent veterinary tests and will be used further to improve Russian beef and dairy herds and flocks.

The Russian buying commission of two live-stock experts and a veterinary surgeon travelled the country inspecting more than 100 herds. Last December, 184 sheep and 27 Landrace pigs were sent to Russia.

THE NUTRITION SOCIETY

The Scottish Group of the Nutrition Society is holding a symposium on " Clean Food " in Aberdeen on Saturday, April 20th. The papers to be read deal with the bacteriology and public health aspects of food poisoning, the inspection of food, protection of food at home and by catering concerns, some clinical consequences of food poisoning, and the spoilage of fish. Those interested are invited to write for further particulars to Dr. J. Davidson, the Rowett Research Institute, Bucksburn, Aberdeenshire.

PROFESSOR BEAUDETTE

Mr. J. E. Wilson writes:—

Professor Beaudette, Professor of Animal Pathology, Rutgers University, New Brunswick, died on January 17th at the Memorial Hospital, New York. He was a world authority on poultry diseases and a pioneer in poultry virology. He was responsible for the early production of vaccines for Newcastle disease and infectious laryngo tracheitis, and has regularly produced masterly surveys on the literature on Newcastle disease, work of inestimable value to research workers all over the world.

I have known him for over 30 years and spent an interesting time with him on my two visits to the United States. In October he was as full as energy as ever and was going over his mammoth collection of viruses and making plans for further work. His death at the age of 59 will be a source of grief to his many friends throughout the world.

MR. WILLIAM KNIGHT BARRON

A correspondent writes:—

William Knight Barron was born in the Wirral in 1876, his father recently having come from Turriff in Aberdeenshire where he had for many years practised as a veterinary surgeon. Mr. Barron qualified at the Dick Veterinary College in 1903, carrying on the practice in Cheshire until, as a territorial, he was swept up in the R.A.V.C. in 1914 for war service.

After the war he retired with the rank of Major, but soon took up practice in Haverfordwest, Pembrokeshire, at that time an important centre of heavy-horse breeding. A few years later he migrated to Newbury where he restored a dying practice to a high level of efficiency. In 1930 he went into partnership in an essentially race-horse practice at Lambourn, but four years later, finding the work somewhat arduous, he moved to Guildford where he again repeated the process of building up a magnificent practice almost from zero. After a few years in retirement at Guildford, he moved once more to Newbury to be near his family. Although experiencing general good health, he was compelled to undergo a major operation in Newbury Nursing Home, which, combined with his age of 81, contributed largely to his unexpected passing on February 13th. Mr. Barron's entire life and interests revolved round his veterinary work, and although he was fond of tennis and boating, he had few other interests.

PERSONAL

Births

BOYD.—On February 14th, 1957, to Connie, wife of Robert Boyd, B.V.SC., M.R.C.V.S., of 53, Station Street, Swaffham, Norfolk, a daughter, Kathleen Margaret.

HUNTER.—On January 21st, 1957, to Carolyn, wife of Francis Hunter, M.R.C.V.S., at the Drayton Hall Maternity Home, Norwich, a daughter, Yvette Frances.

PYKE.—On February 20th, 1957, to Marie (*née* Monk) and Brian Pyke, B's.V.SC., M's.R.C.V.S., of Glovers Close, Chipping Norton, a son, brother for Christopher and Valerie.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

GORTON, Bernard, M.P.S., 22, Arnewood Road, Bournemouth, Hants. Graduated London, July 15th, 1910. Died February 23rd, 1957, aged 73 years.

HUNTING, Charles Samuel, of 16, Forest Road, Loughborough, Leicester. Graduated Edinburgh, May 19th, 1909. Died February 21st, 1957, aged 69 years.

COMING EVENTS

March

2nd (Sat.). Meeting of the Scottish Regional Group of the A.V.T. & R.Ws. at the University of Glasgow Veterinary Hospital, 10.15 a.m.

6th (Wed.). Annual General Meeting of the A.V.T. & R.Ws. Northern Region at the Veterinary Hospital, Liverpool, 2 p.m.

7th (Thurs.). General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

Inaugural Meeting of the British Small-Animal Veterinary Association in the Main Hall, Royal Veterinary College, Camden Town, N.W.1, 3 p.m.

8th (Fri.). Annual General Meeting of the South Wales Division at the Dolwar Café, Carmarthen, 2.30 p.m.

13th (Wed.). Meeting of the Southern Counties Veterinary Society at the Polygon Hotel, Southampton, 7.30 p.m.

14th (Thurs.). Meeting of the South-East Midlands Veterinary Medical Association at Franklin's Gardens Hotel, Northampton, 7.30 p.m.

20th (Wed.). Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Society's house, 5 p.m.

28th (Thurs.). Meeting of the British Veterinary Poultry Association at the Royal Veterinary College, Camden Town, N.W.1, 11 a.m.

30th (Sat.). Annual Convention of the Ceylon Veterinary Association in the Queen's Hotel, Kandy, Ceylon.

April

6th (Sat.). Annual Dinner of the B.R.X. Club at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

20th (Sat.). Annual Dinner of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring.

Meeting of the Scottish Group of the Nutrition Society in Aberdeen for a Symposium on Clean Food.

May

24th (Fri.). 165th Annual Ball of the Royal Veterinary College Students' Union Society at the Royal Veterinary College, Camden Town, N.W.1, 9 p.m.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS IN EDINBURGH

Wednesday, April 10th—Royal (Dick) School of Veterinary Studies

10.15 a.m. Small-Animals Committee.

2.15 p.m. Home Appointments Committee.

4.00 p.m. Farm Live-stock Committee.

Thursday, April 11th—Royal (Dick) School of Veterinary Studies

10.00 a.m. Veterinary State Medicine Committee.

11.30 p.m. Parliamentary and Public Relations Committee.

2.15 p.m. General Purposes and Finance Committee.

Friday, April 12th—Royal (Dick) School of Veterinary Studies

10.15 a.m. Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak

Anthrax

Ayr. Fisherton Farm, Dunure (Feb. 19).

Bucks. Manor Farm, Stone, Aylesbury (Feb. 20).

Dumfries. Newtonairds, Dumfries (Feb. 18).

Dunbarton. Palacerigg, Cumbernauld Station, Glasgow (Feb. 18).

Kirkcudbright. Balgerran Farm, Crossmichael, Castle Douglas (February 19).

Lanarks. Gilbertfield Farm, Cambuslang (Feb. 15); Westhouse, Strathaven (Feb. 18).

Leics. Bondman Hayes Farm, Ratby (Feb. 21).

Northants. White Lodge Farm, Walgrave, Northampton (Feb. 18).

Renfrew. Woodneuk Farm, Barrhead, Glasgow (Feb. 19).

Salop. Church Farm, Loppington, Wem, Shrewsbury (Feb. 21).

Wilts. Overcourt Farm, Brokers Wood, Westbury (Feb. 16); Ferne House Farm, Ferne, Shaftesbury (Feb. 18).

Atrophic Rhinitis

Kent. Parsonage Farm, Stansted, Sevenoaks; Crowhurst Farm, W. Kingsdown, Sevenoaks (Feb. 15).

Fowl Pest

Herts. Slaney Poultry Farm, 12, King George Avenue, Bushey, Watford (Feb. 20).

Lancs. Lane Ends Farm, Brown Lane, Bamber Bridge (Feb. 15); Lower House Fold Farm, Heapey, Chorley; Longlands Farm, Bank Bridge, Tarleton; Ravald Farm, Freckleton (Feb. 16); Paddington, St. Michaels, Preston; Marsh House, Station Road, Little Hoole; Soar Brose House Farm, Samlesbury (Feb. 19); West View, Smallwood Hey, Pilling; Brookfield Nurseries, Blackgate Lane, Tarleton; Moor Hey Farm, Little Hoole; Clifton House Farm, Inglewhite; Brookfield Farm, North Road, Bretherton (Feb. 20); Brown Edge, Southport Road, Scarisbrick; Banks Farm, Station Road, Little Hoole, Preston; Aspden Fold Farm, Samlesbury; Orchard House Poultry Farm, Kirkham Road, Freckleton (Feb. 21).

Yorks. Westfield Farm, Black Road (Feb. 21).

Swine Fever

Berks. Down Place Farm, Water Oakley, Windsor (Feb. 20); East Park Farm, Twyford (Feb. 22).

Cambs. High House Farm, Prickwillow, Ely (Feb. 20); 1, Hinton Road, Fulbourn (Feb. 22).

Denbigh. Bronheulog, Moelfre, Oswestry (Feb. 20).

Devon. East Fishleigh Farm, Hatherleigh, Okehampton (Feb. 21).

Kent. Slaughterhouse, Picardy Manor Way, Belvedere (Feb. 20).

Sussex. Headhome Farm, Lidsey (Feb. 19); Manor Farm, Marchill, Pulborough (Feb. 21).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The British Small-animal Veterinary Association

Sir,—Through the courtesy of your columns readers will have noted that a British Small-animal Veterinary Association is being formed and that the inaugural meeting is to take place at the Royal Veterinary College on March 7th.

The aims of this new association have already been published (*Vet. Rec.* **69.** 6. 117). Considerable interest has resulted but it is particularly important that a full and frank exchange of views will be forthcoming at this inaugural meeting.

A pressing invitation to this meeting is therefore extended to all our colleagues concerned with small-animal work and who share our common interests and problems. Their attention is directed to the Notice and Agenda of this meeting which appear in the Notices columns of this issue.

Yours faithfully,

C. E. WOODROW,

14, Pont Street,
London, S.W.1.

W. B. SINGLETON.

Canine Research Station,
Kennett,
Nr. Newmarket,
Suffolk.

February 26th, 1957.

Petrol Rationing

Sir,—Your leading article of February 2nd is timely and I hope that since its publication other colleagues will have been as fortunate as I in receiving, without further request, an addition to the initial supplementary allowance. Basic and supplementary will now cover the estimated mileage for the practice as in my original application. I would thank the B.V.A. and the local petrol liaison officer for their work in this most urgent matter.

Your leader underlines the indispensable rôle of the practising veterinary surgeon in the production of the nation's food and bases the claim for priority petrol on this alone. Without detraction from this fact I would humbly suggest that of equal merit is the humanitarian or social service character of any and every veterinary practice. The majority of the public, including the farming community, look to the veterinary profession firstly to provide urgent treatment and relief of suffering for their animals. In emergencies the police, too, seek the immediate assistance of the profession. Relevant sections of such Acts as The Protection of Animals Act, The Protection of Animals (Anaesthetics) Act, The Pet Shops Act, The Diseases of Animals Act, and the Veterinary Surgeons' Act, each underline the position of the profession as authorised by Parliament, and such Acts are not associated solely with food production. Small-animal practices may not directly increase food production, but in their own sphere they are as directly

concerned with the relief of suffering as is the medical doctor, and the patient cannot always be brought to the surgery.

Why does your leader overlook the moral logic of our claim for petrol in sole favour of the economic one? They cannot be divided, and on the former we have all our clients firmly behind us, surely? It is such emergencies as road and other accidents, difficult calvings, farrowings, whelpings, foalings, milk fevers, bloat, colic, cruelty cases, pregnancy toxaemias, and animals belonging to the aged and sick, etc., which firstly, in the view of the community, require the profession to be ever mobile. It is not for food production alone, nor solely for financial gain, but always to alleviate suffering and prevent loss that we must be on call. Would it not be for the benefit of the profession that both rôles—economic and humanitarian—receive equal recognition, particularly in regard to liaison with Government Departments?

In conclusion I would refer to the paragraph on page 10 of the Guide to Professional Conduct issued by the Royal College of Veterinary Surgeons and entitled "The General Duty of a Practitioner." Here, clearly stated, are the moral reasons to support any claim by the veterinary profession for a priority.

Yours faithfully,
CECIL SCHWARTZ.

United House,
31, Cardiff Road,
Luton,
Beds.

February 5th, 1957.

Persistent Hymen in the Mare

Sir,—I read with interest Mr. A. S. Harris's article "Persistent Hymen in the Mare" in THE RECORD of September 15th, 1956.

I would recount a case of complete (no aperture) persistent hymen met with in a thoroughbred mare in Ireland in 1927. This mare was 10 years old and had been purchased some months previously at a sales as "believed to be in foal." Time proved her to be empty. In the course of examination I found in the vagina a flaccid, substantial membrane of considerable dimensions which ballooned into the hand when the mare strained, to fall away and lie over the cervix when straining ceased. The cervix was readily palpable through this dead-end curtain which proved to be imperforate. Evidently because of its slackness it did not interfere with copulation.

I saw no reason why this hymen (or whatever it was) should not be easily removed, but at the same time I wondered why this had not been done years before in the case of this potentially valuable brood mare.

A few days later she was cast and chloroformed. With the aid of a Vulsellum forceps and curved surgical scissors I roughly excised this membrane. A quantity—about a half pint—of opaque, seemingly sterile, uterine contents escaped. A few saline uterine douches were given.

In due time this mare was served again (or should one say served properly for the first time). She missed on the first occasion but held at the following oestrus. A fine colt foal was the result. Persistent hymen of this nature in the mare must be very unusual.

Yours faithfully,
J. MULLINS.

P.O. Box 11,
Masterton,
New Zealand.

February 14th, 1957.

Text Books for a Refugee

Sir,—We have received a request from a Hungarian veterinary student in Eger for English books on veterinary surgery, diseases of the internal organs, and obstetrics. Much as we should like to help him, we have no duplicate copies of even relatively recent text-books for disposal. If any of your readers have anything published in the last 10 or 15 years which they would be willing to part with, we should be pleased to receive them on the Hungarian student's behalf.

Yours faithfully,
M. M. RAYMER,
Librarian.

Royal College of Veterinary Surgeons,
9 and 10, Red Lion Square,
London, W.C.1.

February 19th, 1957.

Herd Infertility

Sir,—I would like to express my thanks to Mr. I. B. Munro for his interesting survey of infertility in East Anglia, and furthermore to hope that it is only one of many such surveys from all over the country. There is no doubt that infertility is one of the problems about which we know very little, and it is only by painstaking reviews of this kind that we are likely to progress. If I, therefore, ask a few questions which seem critical, I hope Mr. Munro will realise that they are entirely as friendly criticism.

Under the heading of "Infectious Infertility" it is stated that mucus sampling was only undertaken when the breeding history and clinical signs suggested a venereal infection.

I would be interested to know just what grounds did call for mucus sampling particularly as, according to my reckoning, 39 of these herds were served by A.I. alone where one would not expect a venereal problem. Did any of these herds served by A.I. alone show a *Vibrio fetus* problem, because if so, surely it has a bearing on the method of spread of infection?

I would have been much more content if all the herds had been sampled for evidence of infection both by *Vibrio fetus*, and *Brucella abortus*, before they were considered as unlikely to carry infection.

The confirmation of the work done by Kerr regarding *Br. abortus* infection is, I think, particularly interesting. I am fully prepared to believe that nutritional factors play an important part in herd infertility, but I do feel that some of the conclusions drawn in this paper are made on rather slender evidence. The numbers involved are small, and most of us know only too well how the conception rate can vacillate in a problem herd where no treatment is being undertaken at all.

Until the conception rate has been restored to a reasonable level for a continuous period of three or four years then I should regard it with scepticism, and I hope the author will make a further report in a year or two.

Lastly, I find that Mr. Munro has in every instance been able to attribute the infertility to one cause or another without having a column labelled " cause unknown." I wonder if he inwardly feels so confident about this? I should like, before closing, once again to thank the author for publishing this work and to hope he will not mind my sniping at him. I feel it is only by discussion and criticism that we are able to make progress.

Yours faithfully,

63, Bouverie Avenue, J. B. WHITE.
Salisbury.

February 18th, 1957.

Firing in Horses

Sir,—This subject appears to be again in the limelight and the question arises whether firing is an essential and justifiable method of treatment for certain cases of lameness, in view of the great pain it causes.

My own experience with both acid and line firing is that they serve no really useful purpose, except to ensure a certain amount of rest, so essential in these cases, and to satisfy some owners that " something is being done." Any benefit to be derived from superficial firing can be equally well obtained by blistering and rest.

The only type of firing from which I have had really satisfactory results is deep pin firing, which I consider gives results in many cases of sprained tendons and ligaments which justify this method of treatment.

A year or two before the Second World War, when on holiday I visited the Veterinary College of Stockholm where I met the Principal, Professor Forsell, and had a long discussion with him on the subject of " firing for lameness in horses due to sprained tendons and ligaments." He showed me specimens of sprained tendons which had been pin fired. In some, only part of the tendon had been pin fired, and the horses had been destroyed at various periods (two to six months or more) after the firing had been done. I was most impressed by the increased amount of resolution that had taken place in the fired section compared to that part which had not been fired.

After this demonstration I was more convinced that deep pin firing for certain cases of sprained tendons was very beneficial and the only method of firing justified by use.

The specimens also demonstrated how very essential a long rest—nine months at least—was for this treatment to be a success.

It would be interesting to know the opinions of our leading race-horse trainers on this subject. Some of those with whom I've discussed firing consider both acid and line firing archaic!

Since writing the above I have read Mr. Henderson's letter about the blister bandage. I have used this method of blistering for over 40 years and can thoroughly endorse all Mr. Henderson says about it. I usually use a cantharides blister as I think it is less painful than the biniodide one, and I leave the bandage on for three or four weeks.

Yours faithfully,

T. WILSON.

Barker Street,
Nantwich.

February 16th, 1957.

" Touch of a Vanished Hand "

Sir,—I always find THE RECORD a bit dull, and maybe the enclosed will amuse other wives who " suffer " it every week.

Our two daughters are aged four years and six years. I quote:—

Susan (six): " Bet you don't know where daddy has gone?"

Caroline (four): " Oh yes I do, mummy told me; he's gone to Newmarket to see Aunty Tetanus."

Yours faithfully,

EMILY HYDE SMITH.

Lyon House,
Yaxley,
Nr. Eye,
Suffolk.

February 21st, 1957.

Broadcasts by the " Radio Vet."

Sir,—These broadcasts, on calving, were made at a peak listening hour, at lunchtime, in the " Living from the Land " programme of the Midland Home Service on October 11th and November 15th. One unqualified statement was made in the first broadcast which was brought to my notice by several farmers, a small-animal client, and my next-door neighbour. I apologise for this tardy letter but I fully expected comment on this matter from those champions of our cause who hasten to write to you on such trivialities as the abbreviation of our professional name.

I agree with the " Radio Vet's." main theme, which was that in heifers with a normal forward presentation more trouble is caused by interfering too soon than by leaving them time to calve themselves. But in the third paragraph he states: " Heifers require very much longer than cows; I have left several heifers for nearly three days before assisting them to calve normal live calves; but the majority will calve themselves within 12 to 36 hours." No mention is made at this time of when the second water bladder ruptured, and in my opinion dry labour would result

if the heifer was left in " good " labour much longer than eight hours. On the second broadcast, *a month later*, the " Radio Vet." qualified the picture when he stated that if the nose of the calf has been showing for eight hours or longer then veterinary assistance may be required as the head may become markedly swollen. If the farmer wants to take action before calling in a veterinary surgeon, the broadcaster advises using a sterilised rope placed behind the calf's ears after lubricating the poll and heifer's vagina with lard and pulling when the heifer strains. The next sentence is also rather controversial: " Never pull on the legs first because if you do the shoulders will come forward and increase the impaction." I would say that the volume of the head and legs was equivalent to that of the chest and shoulder blades, so that as the vulva has to stretch to accommodate that volume it was immaterial whether the head, legs, or both were used to draw the calf. I conclude that these broadcasts were " censored " by another, or other, veterinary surgeons and would like to hear if anyone else agrees with my criticisms of these broadcasts which were heard by a mixed listening audience of farmers and lay public.

Yours faithfully,

E. E. HERROD-TAYLOR.

Guy Street,
Leamington Spa.

February 21st, 1957.

Displacement of the Bovine Abomasum

Sir,—Having read the recent publications on " Displacement of the Bovine Abomasum," we offer the following observations. During the last month, we have encountered four cases, three of which recovered spontaneously after starvation for 24 to 48 hours, whilst the other case was subjected to double laparotomy as recommended by Mr. Colin Wood. We were impressed, on each occasion, by the unmistakable borborygmal sounds on auscultating the left flank, which are completely different from the normal, churning ruminal sounds and are, therefore, diagnostic.

However, we disagree that the left abdominal wall should be opened as for rumenotomy and recommend that the left flank incision be extended to a length of 15 inches or more, thus allowing more room for manipulation and draining the abomasum and better access to the abdominal floor. We strongly recommend relieving abomasal tension before any manipulative interference whatsoever (in our case, the operator's finger punctured the abomasal wall with frightening ease). The next step should be the combined operation (involving two persons) of lifting the rumen (manually or by tapes through the ruminal wall as ventrally as possible) and manual replacement of the displaced organ.

Right-flank laparotomy was also performed in our case, and this procedure provided a rude reminder of our lack of knowledge of (or acquaintance with) normal right abdominal live anatomy. Admittedly, the duodenum was found running backwards and upwards, but it was far from easy to trace its origin to the pylorus. In view of the friable nature of the abomasal wall, traction on the pylorus should be very carefully applied, especially in a long-standing case with possible rumeno-abomasal adhesions.

We suggest that a decision on a double approach as distinct from left-flank laparotomy should be based on a preliminary topographical study of each individual, and we recommend that in a " hollow-flanked " cow with a pendulous abdomen the single left-flank incision is sufficient, whereas in a young heifer or a cow with a short flank (*i.e.* a short distance between the last rib and the external angle of the ileum), and hence a smaller abdominal cavity, a double laparotomy may be desirable. In the latter case, it is advisable for an assistant to lift the rumen while the operator applies gentle traction to the pylorus.

The most striking feature in our recent experience was the almost immediate improvement after operation. No rumination had occurred for five days prior to laparotomy, but recommenced within two hours of the completion of surgical replacement.

Yours faithfully,

ERIC I. WILLIAMS,

Trevaughan,
St. Clears,
Carmarthen.

W. H. LLOYD.

22, Picton Place,
Carmarthen.

February 23rd, 1957.

Thrombosis in the Cat

Sir,—It may at this stage be of interest to record one further case of thrombosis in the cat to reinforce my own and Miss Joshua's contention that it is not uncommon.

The case in question appeared to be a mild primary attack which quite fortuitously came to *post mortem*.

The subject was a six-year-old castrated male, at first thought to be a stray. There was a history that it had been found collapsed in the street with strong circumstantial evidence of accident although this had not been seen.

Examination showed pale membranes, coolness of feet, pain on handling the abdominal wall, and pain and swelling in the right gastrocnemius muscular belly. Temperature was 99° F. Femoral pulse was feeble on the left side and unobtainable on the right. There was no bony injury apparent.

In view of doubt as to ownership the animal was taken in under observation for about five hours, after which time it was identified by the owner.

By this time the membranes were a better colour, feet were warmer, and evidence of shock was receding, but the right gastrocnemius was still hard and painful and the pulse on that side was unobtainable. Abdominal wall was still tender.

The diagnosis then given was a combination of bruising and shock from street accident plus right iliac or femoral thrombosis.

Prognosis was good except for the possibility of recurrence of thrombosis. For personal reasons, however, the owner requested destruction and this was carried out.

Post mortem showed extensive bruising of abdominal wall and inside the thighs. Abdominal and chest contents were all normal except for bruising evident on the omentum.

The aorta and its branches were all normal until dissection was continued down the femoral arteries where a small thrombus about 3 mm. in length was found occluding the right femoral artery halfway along its length. The right gastrocnemius muscle was very pale and ischaemic in comparison with the left.

This case following the other recorded cases appears to illustrate very well, firstly that the cramping of the gastrocnemius is useful diagnostic evidence of deprivation of its blood supply; secondly that trauma may in some circumstances be a contributory cause of thrombosis, and thirdly that mild primary attacks of thrombosis may be very readily overlooked unless as in this case by utter chance the case comes to *post mortem* and careful search is then made.

It is hoped that the recording of such cases will lead to a more thorough investigation of the true incidence and symptomatology of thrombosis in the cat.

Yours faithfully,

15, Park Avenue, MARION J. FREAK.
Potters Bar,
Middlesex.

February 23rd, 1957.

Johne's Disease

Sir,—The excellent discussion on Johne's disease at the Congress of the British Veterinary Association, which was published recently in THE VETERINARY RECORD, contains much of interest to everybody working in that field.

Concerning the discussion on the merit of the French type paratuberculosis vaccine containing living bacilli *versus* the vaccine containing heat-killed bacilli which we have been using I should like to make the following comments:—

1. There is no obvious reason why living bacilli should be more effective as a vaccine than an equal quantity of properly killed dead bacilli unless the living bacilli in the vaccine multiply in the vaccinated organism. There is no evidence that the old laboratory strains of *M. paratuberculosis* suspended in oil multiply after subcutaneous inoculation. It seems even unlikely that they do so with sufficient regularity for this to be of importance for the general effectiveness of the vaccine.

2. Before it could be stated that certain strains of *M. paratuberculosis* used as vaccine are completely non-infective under all conditions in the field in animals of any age and breed, very extensive virulence trials would indeed be needed. As is well known, quantitative infectivity tests with *M. paratuberculosis* are not an easy task.

3. We use 5 mg. of vacuum-dried killed bacilli *pro dosi*. With the French type living vaccine 5 mg. of bacilli " pressed between layers of dry filter paper " are employed *pro dosi*. Our killed vaccine could, therefore, possibly contain twice as many bacilli *pro dosi* as does the French vaccine but certainly not 8 or 10 times as many, as stated in the discussion you published.

4. Mr. White's suggestion that skin allergy after vaccination with killed bacilli may wane sufficiently soon so that tuberculin testing for bovine tuberculosis could still be carried out in adult vaccinated cattle is interesting and should certainly be directly tested.

5. May I take this opportunity to mention that vaccination with our vaccine is still giving excellent protection to sheep that received one injection with it in 1950 and in 1951.

Yours faithfully,

BJORN SIGURDSSON.

Institute for Experimental Pathology,
University of Iceland,
Keldur,
Reykjavik,
Iceland.

February 13th, 1957.

The Post of Public Relations Officer

Sir,—Knowing it as I do I have long been an admirer of the veterinary profession. I was therefore extremely pleased to find that once again the B.V.A. had proved itself a progressive, forward thinking body by its decision to appoint a Public Relations Officer. Imagine my surprise when I discovered that the salary offered was only the same as that offered to an assistant in practice, and the only essential qualification—that the applicant should be a veterinary surgeon!

The B.V.A. has rightly helped to ensure that no unqualified person may lawfully practise veterinary medicine and thus established the principle of " every man to his job." If my dog is sick do I seek the advice of my colleagues in the advertising profession? Absurd? Yes, but no more absurd than specifying membership of the Royal College as an essential requirement for public relations work.

May I respectfully suggest that the B.V.A. follows my example in obtaining expert professional advice, and, in pursuance of its own principles, seeks the services of a P.R.O. who is fully experienced in his subject? Before it is too late, Gentlemen, be advised that contrary to the belief held in some ill-informed quarters, the successful development of good public relations requires a most thorough knowledge and experience of the work and cannot efficiently be " picked up " by a junior member of the profession *because* he is a member of that profession.

The advertisement should be withdrawn forthwith and the position reoffered, the qualification required being a wide knowledge of public relations work, with a secondary requirement, if necessary, of some knowledge of the veterinary profession or animal husbandry.

To proceed with the existing plan is to court disaster —the disaster of an amateurish, inefficient service which will only invite ridicule. The far-sighted decision to appoint a P.R.O. deserves a better fate.

Yours faithfully,

50, Great Abington, J. N. HIGNETT.
Cambridge.

February 25th, 1957.